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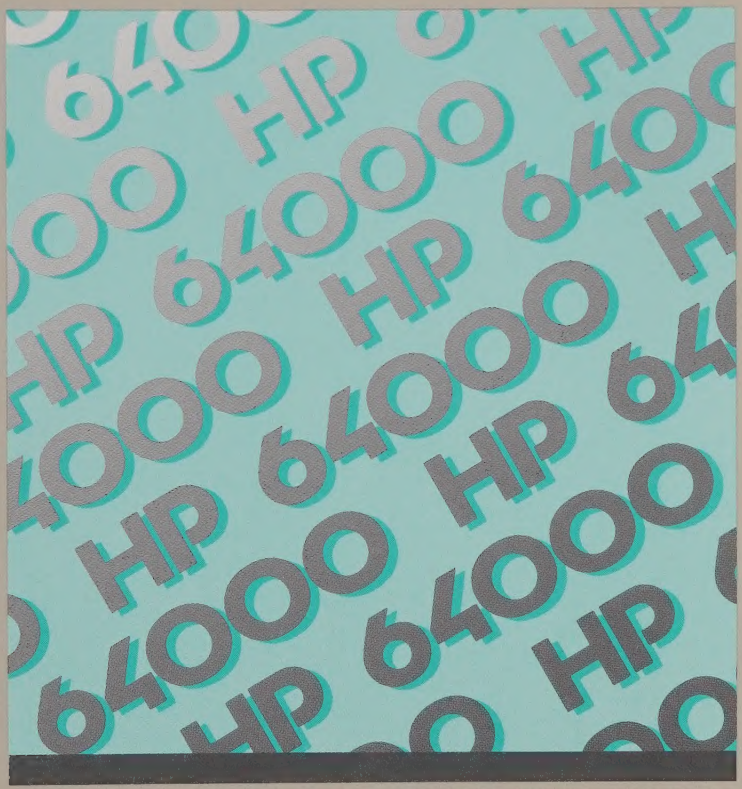

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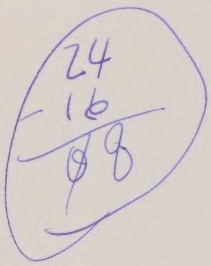

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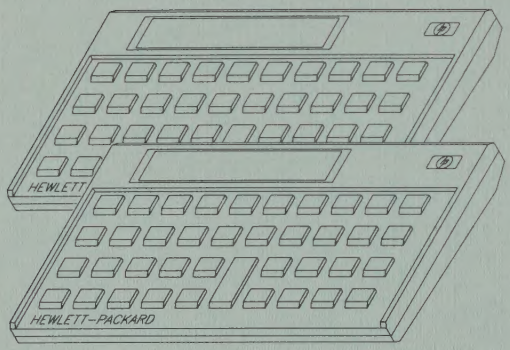

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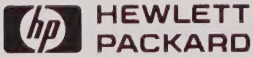

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1

System Overview

Introduction

This chapter contains an overview of the HP 64700 Series emulators and the other products and host environments related to them. This chapter contains sections on the following topics:

- HP 64700 system, emulation, and analysis features.
- Basic configurations and related user interfaces.
- PC Interface.
- Softkey Interface.
- Terminal Interface.
- HP 64700 Series documentation.

Overview of HP 64700 Series Emulation/Analysis

An emulator is an instrument which replaces the microprocessor in your target system to help you integrate target system software and hardware. The goal of an emulator is to operate just like the processor which it replaces, while at the same time, giving you information about the bus cycle operation of the processor. An emulator gives you control over target system execution and allows you to view the contents of processor registers, target system memory, and I/O resources.

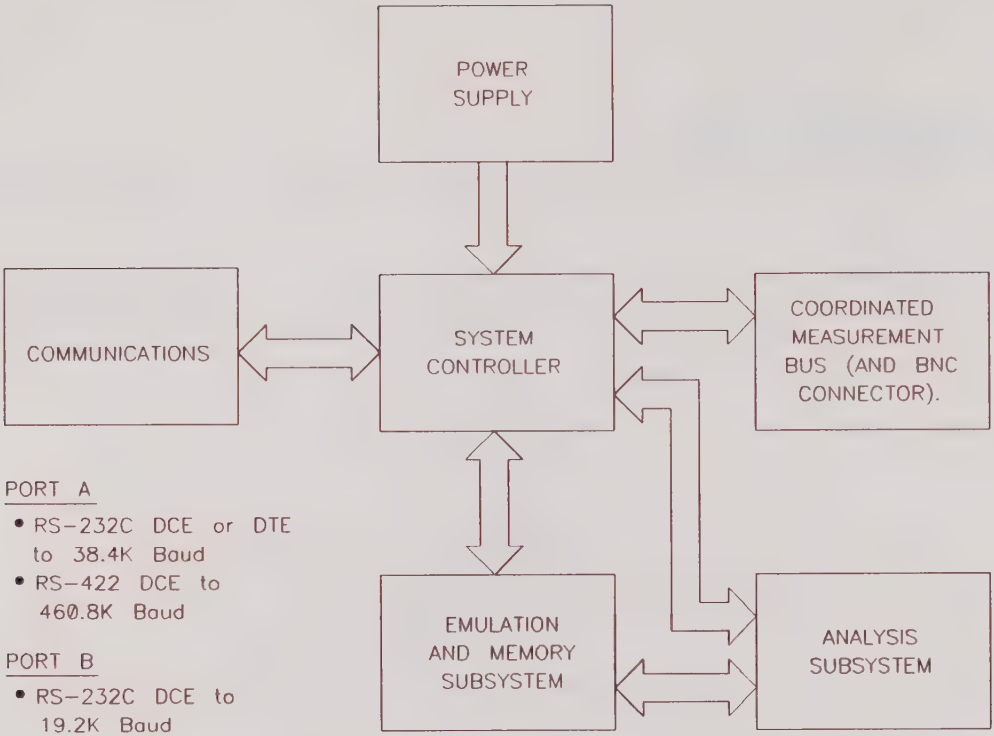

Figure 1-1. Block Diagram of HP 64700 Series Emulator

An analyzer is an instrument which captures activity on signals synchronously with a clock signal. An emulation analyzer captures emulator bus cycle information. An external analyzer captures activity on signals external to the emulator, typically other target system signals.

An HP 64700 Series emulator (Z80, 68000, 80186, ...) is a self-contained emulation system. It includes a power supply, emulation controller, emulation memory and memory mapper, internal emulation analyzer, and optionally, an external analyzer. Because the emulation system is self-contained, you need only a

basic terminal with the HP 64700 Series emulator to operate within a target system.

HP 64700 Series System Features

Listed below are features of the HP 64700 Series emulation/analysis system.

Standalone Emulation Vehicle

The emulator is controllable via a basic terminal, and it may be configured in a number of different ways. The emulator package also provides a number of advantages:

- The emulator is small and lightweight which makes it portable and easy to position.
- Long probe cables with low profile connectors make it easier to plug the emulator into hard-to-access target system processor sockets.
- The emulators come equipped with a pair of handles, which can be attached to the emulator at several points. The handles allow you to stand, suspend, or prop up the emulator as close to the target system as possible.

Communications

Your HP 64700 Series emulator provides two communications ports.

- Port A is capable of being either a DCE (Data Communications Equipment) or DTE (Data Terminal Equipment) port for RS-232C. Embedded in Port A is RS-422 capability. RS-422 is a balanced, differential, and synchronous transmission protocol operating as a DCE device and capable of baud rates up to 460.8K Baud.
- Port B is a DCE only configuration.

Parameters such as baud rate, handshaking, and parity can be preset at system initialization (power-on or reset) through switches on the rear panel. However, any of these parameters can be altered by software commands as well.

Since the two ports can operate independently of each other, a pass-through (*transparent*) mode and datacom buffering are possible in the HP 64700 Series system. Thus, under software, commands may be made to pass through the HP 64700 Series instrument to the next device down the line. This permits the use of the HP 64700 Series emulator with a mainframe computer where a single port to the computer exists at an engineer's desk. Also the transparent mode can be useful for attaching a PROM programmer or printer to a single PC host port, without the necessity of a second host I/O port.

The *HP 64700 Emulators: Hardware Installation and Configuration* manual contains more information on the various port configuration options.

Support of Several Absolute File Formats

You can load absolute files into the HP 64700 Series emulators in the following file formats:

- HP format absolute files. These files are binary format files and are downloaded with HP's **transfer** utility.
- Motorola S-record.
- Intel hexadecimal.
- Tektronix hexadecimal.

Self Test and Performance Verification

On power-up, the HP 64700 Series emulation systems perform performance verification tests. If the self tests pass, two green LEDs behind the emulator front panel are lit.

There is also a system **pv** command which allows you to run more extensive performance verification tests.

Coordinated Measurements (Multiple Emulator Start/Stop)

The Coordinated Measurement Bus (CMB) allows you to start and stop multiple emulators at the same time, and it provides for analyzer cross-triggering.

Connection to signals from external resources, such as logic analyzers or other external instruments is through a standard BNC connector and 50 ohm coaxial cables.

Normally, up to 16 emulators may be connected together on a CMB cable no more than 50 meters in length. Up to 32 emulators may be connected under certain circumstances.

The *HP 64700 Emulators: Hardware Installation and Configuration* manual contains information on connecting multiple emulators via the CMB, or other instruments via the BNC connector. The *HP 64700 Emulators: CMB User's Guide* contains information on making coordinated measurements.

Emulation Features

Listed below are features present in most HP 64700 Series emulators. Some of these features may not appear in every HP 64700 Series emulator. Certain emulators may have additional features.

Hybrid Foreground or Background Emulation Monitors

The monitor is a program that is executed by the emulation processor. It allows the system controller to access target system resources. For example, when the emulator is executing a target program and you enter a command that requires access to target system resources (display target memory, for example), the system controller writes a command code to a communications area and breaks the execution of the emulation processor into the monitor.

The monitor program then reads the command from the communications area and executes the processor instructions which access the target system. After the monitor has performed its task, execution returns to the target program. Entry into and exit from the monitor is controlled by emulator hardware. Monitor program execution can take place in the *background* or *foreground* emulator modes.

Foreground In the foreground emulator mode, the emulator operates as would the target system processor.

Background In the background emulator mode, foreground operation is suspended so that the emulation processor may be used for communication with the system controller, typically to perform tasks which access target system resources.

Background Monitors A background monitor program operates entirely in the background emulator mode; that is, the monitor program does not execute as if it were part of the target program. The background monitor is non-intrusive. It does not take up any processor address space and does not need to be linked to the target program. The monitor resides in dedicated background memory.

Foreground Monitors A foreground monitor program performs its tasks in the foreground emulator mode; that is, the monitor program executes as if it were part of the target program. Breaks to the monitor still put the emulator into the background mode; however, foreground monitors switch back to the foreground mode before performing monitor functions.

Foreground monitors are resident in the emulator firmware, as are background monitors. However, foreground monitors are also shipped with the emulator on a floppy disc so that you may customize them, if necessary.

Visible or Hidden Background Cycles

Emulation processor activity while running in background can either be visible to, or hidden from, the target system.

When a break to background occurs and background cycles are hidden, the emulator appears to the target system to have suspended operation until a return to foreground.

The design of the target system may, however, require that the emulator appear to always be running (in order to refresh dynamic memories, for example). If this is the case, you may configure the emulator so that background cycles are visible to the target system. When background cycles are visible, they will appear as reads (or other non-destructive types of cycles).

You can change the base address of the monitor if it is necessary to "place" the monitor in a memory range where read operations will not cause an undesired interaction.

High Performance Emulation Memory (No Wait States)

Emulation memory is high-speed memory. When the emulator operates out of emulation memory, no wait states are required.

The emulation memory system is a dual-port design. This means that either the emulation processor or the system control processor can access the emulation memory array independently of the other. Commands which access emulation memory do not cause breaks in program execution.

Memory Mapping and Characterization

Memory mapper circuitry in the emulator allows you to place emulation memory anywhere in the logical address space of the emulation processor. It provides logical to physical address translation from the emulation processor to emulation memory. Blocks of memory may be characterized as emulation RAM, emulation ROM, target RAM, target ROM, or as guarded memory. You may allow breaks into the emulation monitor on guarded memory accesses or writes to ROM.

Software Breakpoints

In addition to the hardware breakpoints provided by the analyzer, HP 64700 Series emulators provide software breakpoints.

Coverage Analysis

Read or write accesses to emulation memory will be recorded in an additional hardware bit in the memory system.

Emulation Analyzer Features

All HP 64700 Series emulators contain an emulation analyzer which allows you to trace microprocessor activity.

Simple Trigger

You may cause the analyzer to trigger and begin storing trace states on a simple condition.

Sequencer

You may trace a sequence of events.

Storage Qualification

You may store up to 1024 selected analyzer states.

Prestore Qualification

You may store up to two previous states for each stored state, and you may qualify the states which get prestored.

State or Time Count Tags

Count tags allow you to view the time it takes for states to execute, or you may count the occurrences of a particular analyzer state. When count tags are used, the maximum number of stored states becomes 512.

External Analyzer Features

Your HP 64700 Series emulator may optionally contain an external analyzer. The external analyzer provides 16 additional trace signals which may be used to capture target system activity other than the microprocessor execution captured by the emulation analyzer.

Mode Selection

The external analyzer may be configured as:

- Part of the emulation analyzer (both the emulation and external analyzers are clocked with the same internal clock signal).
- An independent state analyzer (which operates identically to the emulation analyzer).
- An independent 100 MHz timing analyzer.

Threshold Voltage Specification

You can specify the threshold voltages of the 16 external trace lines as TTL, CMOS, ECL, or other levels within a range of -6.4 to 6.35 volts with a 50 mV resolution.

Cross-Triggering

Two internal lines are available to allow cross-triggering between the emulation and external analyzers.

Basic Configurations & Related User Interfaces

HP 64700 Series emulators may be used in the HP 64000-PC Personal Integration Environment, in the HP 64000-UX Advanced Integration Environment, with other host computers, or with a plain terminal. Typically, the environment in which the emulator is used will dictate the configuration of the emulator and the interface used to control the emulator.

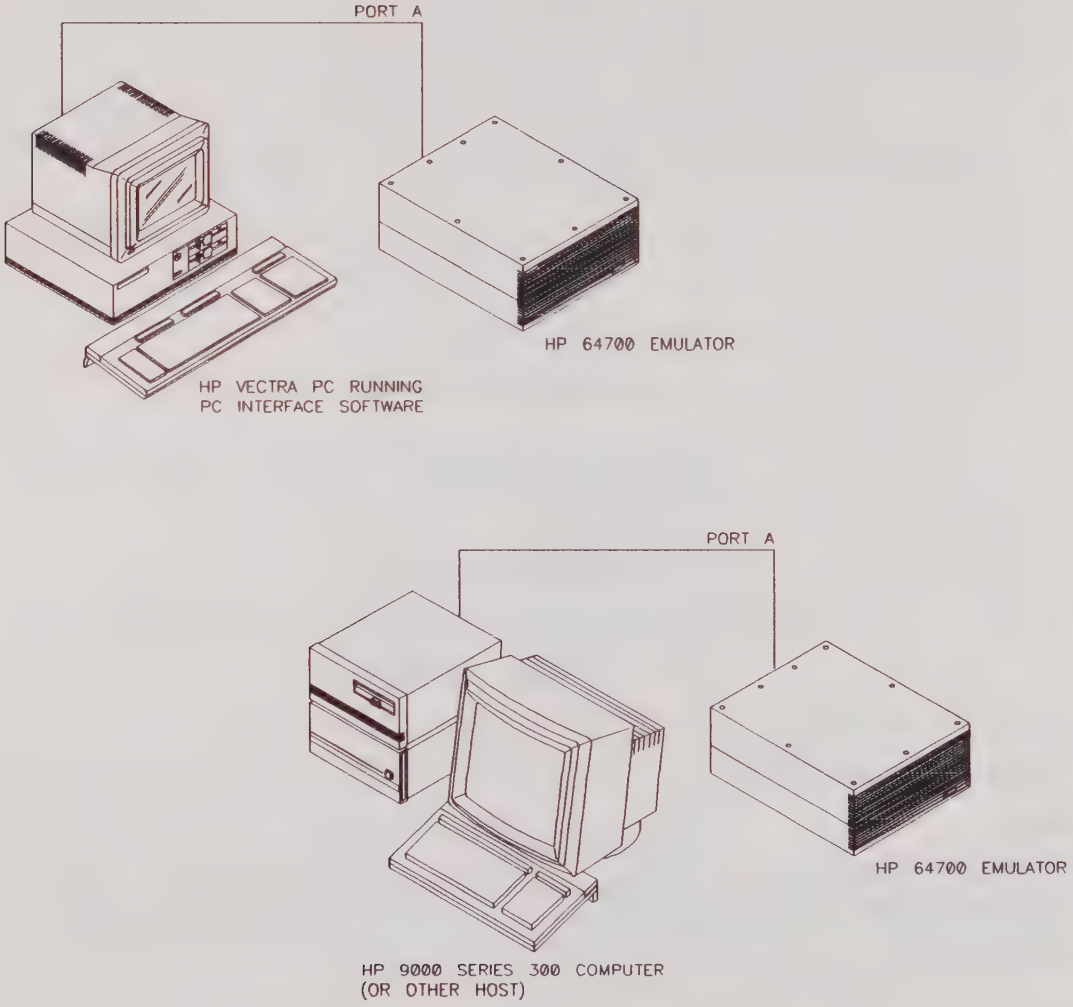

Figure 1-2. Remote Configurations

Remote Configuration

The HP 64700 Series emulator is in a *remote configuration* when the emulator is connected to a host computer port, and is not directly connected to a terminal. When in the remote configuration, all communication between the emulator and the host computer (downloading absolute files, commands, command results, etc.) takes place over that single port.

Typically, the emulator is controlled by an interface program running on the host computer. Interface programs for the HP 64000-PC Personal Integration Environment and the HP 64000-UX Advanced Integration Environment are supported.

However, a terminal emulation program running on the host computer may be used to control the emulator with the commands provided by the firmware resident *Terminal Interface*. Two remote configurations are shown in figure 1-2.

HP 64000-PC Personal Integration Environment - PC Interface

The HP 64000-PC Personal Integration Environment consists of HP and third party development tools (compilers, assemblers, linkers, etc.) hosted on an HP Vectra, IBM PC AT, or PC AT clone.

In the HP 64000-PC environment, the host computer interface program is the *PC Interface*.

HP 64000-UX Advanced Integration Environment - Softkey Interface

The HP 64000-UX Advanced Integration Environment consists of HP and third party development tools (compilers, assemblers, linkers, etc.) hosted on an HP 9000 Series 300 computer.

In the HP 64000-UX environment,the host computer interface program is the *Softkey Interface*.

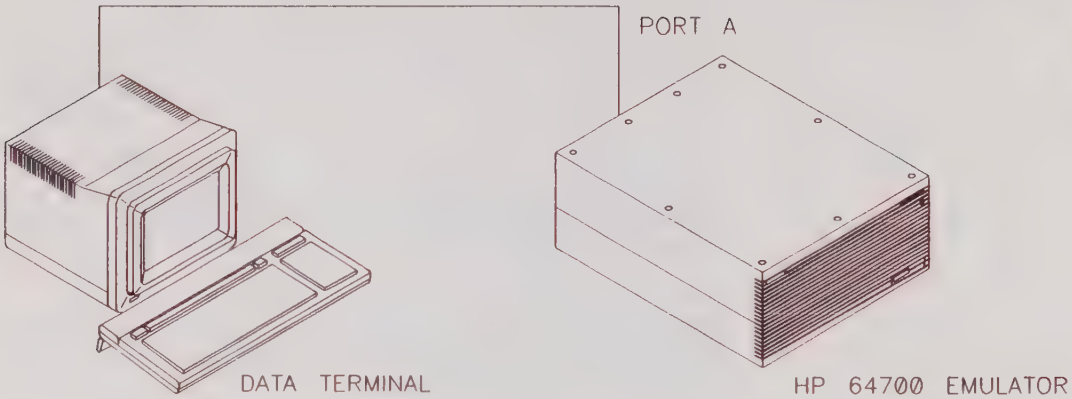

Figure 1-3. Standalone Configuration

Standalone Configuration

Using a basic terminal to control an HP 64700 Series emulator is the simplest possible type of configuration. This is called the *standalone configuration*. Typically, in this configuration, the terminal is connected to emulator Port A. Commands are entered from the terminal's keyboard, and results (up to 80 columns) are viewed on your terminal's display. The standalone configuration is shown in figure 1-3.

The command interface used in the standalone configuration is called the *Terminal Interface*.

Typically, the standalone configuration is used in situations where target system programs are already in target ROM; this is the case because the only way to enter programs in the standalone configuration is by modifying memory locations, a process which is not practical for large programs.

In the standalone configuration, you can isolate problems by tracing program execution. You can copy the contents of ROM memory locations into emulation memory where you can perform coverage testing, use software breakpoints to debug code, or test code patches before new ROMs are made.

When HP 64700 Series emulators are used in the standalone configuration, one of the emulator ports is free to be connected to a printer, or perhaps another emulator (when debugging multi-processor systems).

Transparent Configuration

An extension of the standalone configuration that allows absolute code to be downloaded into the emulator can be made by connecting the other emulator port to a host computer (HP 9000 Series 300, VAX computer, etc.). This is called the *transparent configuration*. It is easiest to think of this configuration as a normal terminal on a host computer, except that an HP 64700 Series emulator appears between the terminal and the host. An example of the transparent configuration is shown in figure 1-4.

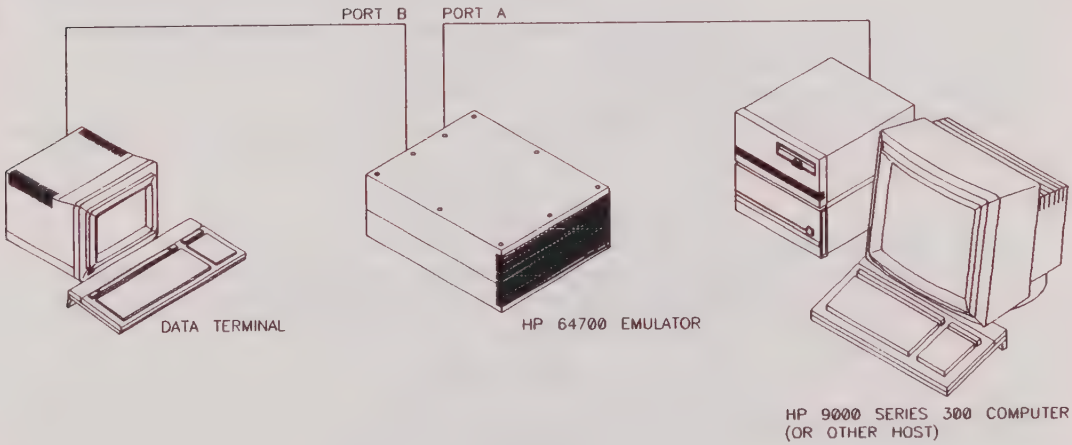

Figure 1-4. Transparent Configuration

The transparent configuration is typically used in situations where code development is done on the host computer, but there is no interface program which runs on the host computer to control the emulator. Since the emulator accepts absolute files in a number of different file formats, the transparent configuration is a practical way to use the emulator with a wide variety of host computers.

When an HP 64700 Series emulator is used in the transparent configuration, both ports are used. However, multiple emulators may be controlled by connecting them is series between the terminal and the host computer.

PC Interface

The PC Interface is an HP 64000-PC hosted program which provides easy interaction with HP 64700 Series emulators and additional features not available in the Terminal Interface. The PC Interface is a window-oriented program which allows you to display different types emulation and analysis information in different windows. You can save window contents to files. The PC Interface allows you to enter commands with a minimum number of keystrokes.

List of Features

Some of the features provided by the PC Interface are listed below:

Symbolic Debugging

The PC Interface program can access the assembler and linker symbol files present on the host personal computer to provide symbolic debugging.

External Timing Analysis

You can place the external analyzer in the independent timing mode from within the Terminal Interface, but the Terminal Interface does not display the (binary) output data of the timing commands it allows. However, the PC Interface can consume this binary information to give you full use of the external timing analyzer.

Windows

The PC Interface is a window-oriented interface. You can activate a window to view command results. Inactive windows do not display updated information as it becomes available, but the information is stored and can be viewed by activating the window. You can create user-defined windows. You can zoom in on a window, causing it to take up the full screen. You can change the size of windows, the number of lines in the window buffer, and the colors used (if you have a color monitor).

Easy Command Entry

Items of command syntax are selected by single keystrokes or by selecting a command option and pressing the enter key. Command lookahead allows you to view the options available. Forms are used by certain commands to prompt for the necessary information.

Terminal Window

The terminal window allows you to access the Terminal Interface from within the PC Interface. You can use the terminal window to access the full power of the analyzer (in its complex configuration).

Forking to MS-DOS

You can access MS-DOS, perform commands there, and exit back into the PC Interface.

Command Logging

You can log commands and results to a file, and you can execute commands from a file to which commands have been logged.

Command Recall

You can recall commands that have been previously entered.

For More Information

The *HP 64700 Emulators PC Interface: User's Reference* describes the PC Interface in detail. Also, if you have ordered your HP 64700 Series emulator with the PC Interface option, there is a manual which describes how to use that emulator with the PC Interface. Refer to the "Documentation" section at the end of this chapter.

Softkey Interface

The Softkey Interface is a HP 64000-UX hosted program which provides easy interaction with HP 64700 Series emulators and additional features not available in the Terminal Interface. The Softkey Interface allows you to enter commands by pressing softkeys.

For More Information

The *HP 64700 Emulators Softkey Interface: User's Reference* describes the Softkey Interface in detail. Also, if you have ordered your HP 64700 Series emulator with the Softkey Interface option, there is a manual which describes how to use that emulator with the PC Interface. Refer to the "Documentation" section at the end of this chapter.

Terminal Interface

The Terminal Interface provides short commands, and includes an excellent "help" facility, command recall, macros, and "equate" statements to make using the commands easy.

List of Features

Some of the features provided by the Terminal Interface are listed below:

The "help" Facility

The Terminal Interface contains an excellent help facility. If you need a reminder about the commands available, or about the options available in a particular command, simply enter the **help** or **?** command from the prompt.

Help information exists for each command. Additionally, there is help information for each of the emulator configuration items.

Command Recall

Command recall is provided in the Terminal Interface. This feature allows you to search forward or backward through the most recent commands entered.

Macros

You can use macros to name and save a sequence of commands. Later, you can enter the name of this macro as you would enter any other command, and the entire sequence of commands saved in the macro will be repeated.

Equates

You can equate names to numeric expressions. Predefined equates assign names to common emulation status (used in analyzer trace qualifiers). You can equate program addresses with names to create labels, and you can use these labels in other commands.

The Repeat Command

If you want to repeat a sequence of commands (even a sequence of macros) a certain number of times, you can use the **rep** command.

Command Files

When in the transparent configuration, you can enter commands from files on the host computer. Also, you can save the state of the emulator into a command file and restore this state at a later time.

The Echo Command

You can use the echo command to send strings or expression results to the standard output. The ability to send strings to the standard output can be useful with command files. You can use the echo command to display the result of an expression, much as you would use a calculator.

The Version Command

You can enter the version command to display information about the resident firmware.

The Date Command

The HP 64700 Series emulators contain a real-time clock, and you can use the date command to set this clock or display the current time.

Combining Features

You can combine Terminal Interface features to do a variety of things. For example, you can use the echo command to send a "clear screen" escape character to the terminal, display memory, and put these commands inside a repeat command to display memory repetitively.

For More Information

The *Terminal Interface: User's Reference* describes the Terminal Interface in detail. Also, each emulator is shipped with a manual which describes how to use that emulator with the Terminal Interface. Refer to the "Documentation" section at the end of this chapter.

HP 64700 Series Documentation

You should have already read the READ ME FIRST package which contains a map of the HP 64700 Series documentation and tells you read this, the *HP 64700 Emulators: System Overview*, manual first.

The previous information in this chapter gives you a general overview of the HP 64700 Series emulation system. This section tells you where to find more information on the different aspects of the HP 64700 Series system.

First, the structure of the HP 64700 Series documentation and the manuals which make up the documentation package are described. Then, different tasks you will perform while using the HP 64700 Series products are listed, and the accompanying information will tell you which manual to refer to for information on how to perform the task.

Structure of the HP 64700 Series Documentation

The HP 64700 Series emulators can be used with three user interfaces: the PC Interface, the Softkey Interface, or the Terminal Interface. Subsequently, documentation is provided for each of these interfaces.

For example, there are three basic documents which describe the HP 64764 (80186) emulator: the *Terminal Interface: 80186/188 Emulator User's Guide*, the *PC Interface: 80186/188 Emulator User's Guide*, and the *Softkey Interface: 80186/188 Emulator User's Guide*. If you ordered your emulator with the PC Interface option, you will want to use the PC Interface user's guide. Likewise, if you ordered the emulator with the Softkey Interface option, you will want to use the Softkey Interface user's guide. If you ordered the emulator

without the PC Interface or Softkey Interface options, you will want to use the Terminal Interface user's guide.

When an emulator is ordered with an interface program running on the host computer (PC Interface or Softkey Interface), the Terminal Interface documentation is included in the documentation package because the Terminal Interface may be accessed from within either host computer interface.

The Manual Maps

The manual maps show the hierarchy of the HP 64700 Series documentation. They show the order of the manuals you should read to learn about an HP 64700 Series emulator.

There are three different manual maps, each describing the related manuals for a particular user interface.

List of Manuals

In some cases below (as for emulation manuals), a general class of manual is described instead of an individual manual.

System Overview

The *System Overview* manual (this manual) is the first manual you should read if you are new to the HP 64700 Series products. This manual is shipped with each HP 64700 Series emulator.

Hardware Installation and Configuration

The *Hardware Installation and Configuration* manual is typically the manual you would refer to after reading the *System Overview*. This manual contains instructions on how to connect the emulator to terminals or host computers in various configurations. This manual is shipped with each HP 64700 Series emulator.

Glossary of Terms

This manual contains definitions of terms used throughout the HP 64700 Series documentation. This manual is shipped with each HP 64700 Series emulator.

Support Services

This manual contains a listing of the Hewlett-Packard Sales and Service offices, as well as information about the Software Materials Subscription (SMS) and Response Center services. This manual is shipped with each product related to HP 64700 Series emulation.

Terminal Interface: User's Reference

This reference document contains descriptions of the commands available in the Terminal Interface. (Some commands will be specific to a particular HP 64700 Series emulator; in this case, the description of the specific command is included in the emulator manual.) The descriptions contain syntax diagrams, lists of the available parameters, default conditions, and examples. The command descriptions appear in alphabetical order. You will typically refer to this manual when you have questions about a particular command which are not answered by on-line help. This manual is shipped with each HP 64700 Series emulator.

PC Interface: User's Reference

This manual shows you how to set up and use the PC Interface. Features of the PC Interface are documented as well as topics like how to perform coordinated measurements from this interface, etc. This manual is shipped with all HP 64700 Series emulators ordered with the PC Interface option.

Softkey Interface: User's Reference

This manual shows you how to set up and use the Softkey Interface. Features of the Softkey Interface and other concerns about operating the emulator in the HP 64000-UX environment are described. This manual is shipped with all HP 64700 Series emulators ordered with the Softkey Interface option.

Terminal Interface: Emulator User's Guides

These manuals show you how to use a specific HP 64700 Series emulator with the Terminal Interface. Each HP 64700 Series emulator will be shipped with a user's guide for the Terminal Interface.

PC Interface: Emulator User's Guides

These manuals show you how to use a specific HP 64700 Series emulator with the PC Interface. An HP 64700 Series emulator ordered with the PC Interface option will be shipped with a user's guide for the PC Interface.

Softkey Interface: Emulator User's Guides

These manuals show you how to use a specific HP 64700 Series emulator with the Softkey Interface. An HP 64700 Series emulator ordered with the Softkey Interface option will be shipped with a user's guide for the Softkey Interface.

Terminal Interface: Analyzer User's Guide

This manual shows you how to use the HP 64700 Series analyzer with the Terminal Interface trace commands. Both the emulation analyzer and the optional external analyzer are described in this manual. Since the emulation analyzer operates the same in all HP 64700 Series emulators, this manual is shipped with each emulator.

PC Interface: Analyzer User's Guide

This manual shows you how to use the HP 64700 Series analyzer from the PC Interface. Both the emulation analyzer and the optional external analyzer are described in this manual. The external analyzer's timing mode is described in this manual. (Timing analysis is not available in the Terminal Interface.) Since the emulation analyzer operates the same in all HP 64700 Series emulators, this manual is shipped with each emulator ordered with the PC Interface option.

Softkey Interface: Analyzer User's Guide

This manual shows you how to use the HP 64700 Series analyzer from the Softkey Interface. Both the emulation analyzer and the optional external analyzer are described in this manual. The external analyzer's timing mode is described in this manual. (Timing analysis is not available in the Terminal Interface.) Since the emulation analyzer operates the same in all HP 64700 Series emulators, this manual is shipped with each emulator ordered with the Softkey Interface option.

Terminal Interface: Coordinated Measurement Bus User's Guide

This manual describes how to set up and perform coordinated measurements with the Terminal Interface. Topics include: how to start and stop multiple emulators, how to cross trigger between multiple emulators, and how set up breaks to the monitor on the reception of CMB signals. This manual is shipped with each HP 64700 Series emulator.

Where to Find Information About:

Listed below are tasks you will perform when using the HP 64700 Series system. The accompanying description tells you which manual to reference to find out how to perform that task.

Installing Host Computer Software

Standard procedures are used to install software on Hewlett-Packard host computers; the documentation for the hosted software will list the requirements of the hosted software and then refer to the host computer documentation for the installation procedure. Refer to the *HP 64000-PC MS-DOS Applications Software Installation* manual when installing personal computer software. Refer to the *HP-UX System Administrator Manual* when installing software on the HP 9000 Series 300 computer.

Downloading Absolute Files

The downloading of absolute files is performed differently depending on the interface you are using. Refer to the appropriate hosted interface *User's Reference*.

Command Syntax

Refer to the appropriate hosted interface *User's Reference*.

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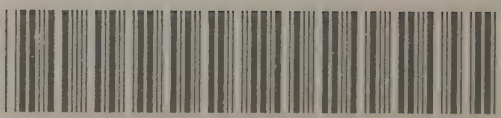

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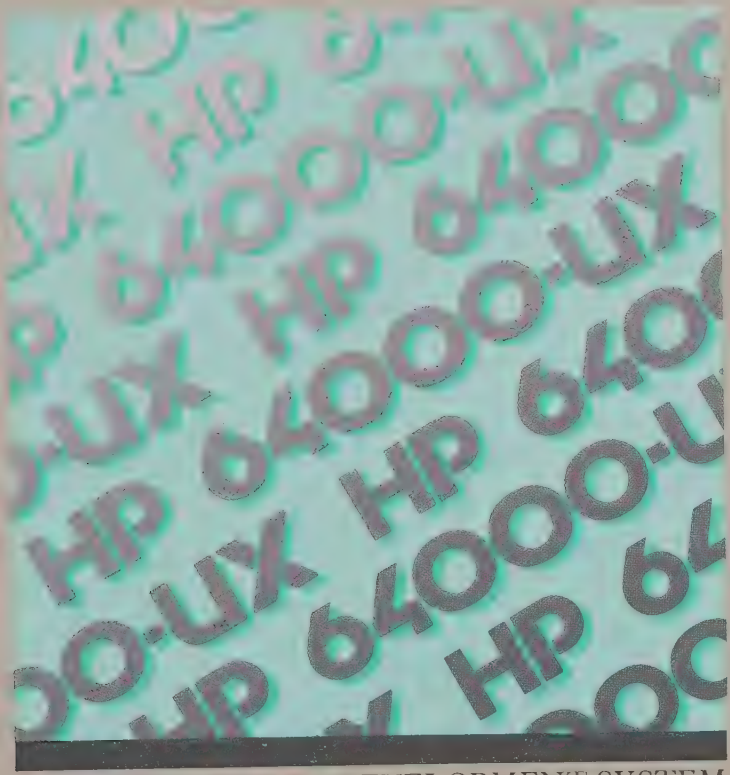

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Hardware Installation And Configuration User's Manual

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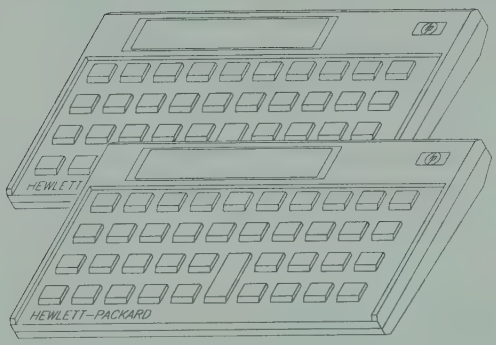

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HP 64700-Series Emulators

Hardware Installation And Configuration

User's Manual

64740-97004
Printed in U.S.A.
March 1990

Edition 3

Certification and Warranty

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Warranty

This Hewlett-Packard system product is warranted against defects in materials and workmanship for a period of 90 days from date of installation. During the warranty period, HP will, at its option, either repair or replace products which prove to be defective.

Warranty service of this product will be performed at Buyer's facility at no charge within HP service travel areas. Outside HP service travel areas, warranty service will be performed at Buyer's facility only upon HP's prior agreement and Buyer shall pay HP's round trip travel expenses. In all other cases, products must be returned to a service facility designated by HP.

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Printing History

New editions are complete revisions of the manual. The date on the title page changes only when a new edition is published.

A software code may be printed before the date; this indicates the version level of the software product at the time the manual was issued. Many product updates and fixes do not require manual changes, and manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual revisions.

Edition 1	64740-90903, November 1987 E1187
Edition 2	64740-90903, April 1989 E0489
Edition 3	**64740-97004, March 1990**

Electromagnetic Interference

What is Electromagnetic Interference?

All types of electronic equipment are potential sources of unintentional electromagnetic radiation which may cause interference with licensed communication services. Products which utilize digital waveforms such as any computing device are particularly characteristic of this phenomena and use of these products may require that special care be taken to ensure that Electromagnetic Interference (EMI) is controlled. Various government agencies regulate the levels of unintentional spurious radiation which may be generated by electronic equipment. The operator of this product should be familiar with the specific regulatory requirement in effect in his locality.

The HP 64700-Series Emulators have been designed and tested to the requirements of the Federal Republic of Germany VDE 0871 Level A. They have been licensed with the German ZZF as Level A products (FTZ - SerienprGfnummer C - 464/88). These specifications and the laws of many other countries require that if emissions from these products cause harmful interference with licensed radio communications, that the operator of the interference source may be required to cease operation of the product and correct the situation.

Reducing the Risk Of EMI

1. Ensure that the covers and front and rear metallic shielding panels are properly installed and that all screws are tight (do not over tighten).

2. Ensure that a properly shielded cable (such as those recommended in this manual) is used to connect each of the RS-232C ports (Port A and Port B) to their respective controllers or peripherals.

3. Ensure that a shielded coaxial cable is used to connect the BNC trigger port on the rear of the instrument to other equipment.

4. When the HP 64700 emulator is not in use, select "external clock" from the emulator configuration options and disconnect the emulation probe from the target system.

Reducing Interference

In the unlikely event that emissions from the HP 64700-Series Emulators result in electromagnetic interference with other equipment, you may use the following measures to reduce or eliminate the interference.

1. If possible, increase the distance between the HP 64700-Series Emulator and susceptible equipment.

2. Rearrange the orientation of the chassis and cables of the HP 64700-Series Emulator.

3. Plug the HP 64700-Series Emulator into a separate power outlet from the one used by the susceptible equipment (the two outlets should be on different electrical circuits).

4. Plug the HP 64700-Series Emulator into a separate isolation transformer or power line filter.

5. Make sure that any peripheral devices (such as printers) connected to either port of the HP 64700-Series Emulator meet local radio frequency emissions regulations.

You may need to contact your local Hewlett-Packard sales office for additional suggestions. Also, the U.S.A. Federal Communications Commission has prepared a booklet entitled *How to Identify and Resolve Radio - TV Interference Problems* which may be helpful to you. This booklet (stock #004-000-00345-4) may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 U.S.A.

Manufacturer's Declarations

U.S.A. Federal Communications Commission

Warning - This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Federal Republic of Germany

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Notes

Safety

Summary of Safe Procedures

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

Ground the Instrument

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away from Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Service or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Do Not Substitute Parts or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

Warning

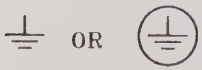
Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.

Safety Symbols Used in Manuals

The following is a list of general definitions of safety symbols used on equipment or in manuals:

Instruction manual symbol: the product is marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be marked with this symbol).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating the equipment.

Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual before operating the equipment.

Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

Alternating current (power line).

Direct current (power line).

Alternating or direct current (power line).

Note

The Note sign denotes important information. It calls your attention to a procedure, practice, condition, or similar situation which is essential to highlight.

Caution

The Caution sign denotes a hazard. It calls your attention to an operating procedure, practice, condition, or similar situation, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

Warning

The Warning sign denotes a hazard. It calls your attention to a procedure, practice, condition or the like, which, if not correctly performed, could result in injury or death to personnel.

Using this Manual

This manual shows you how to install HP 64700-Series Emulators to provide you with a useful emulation system.

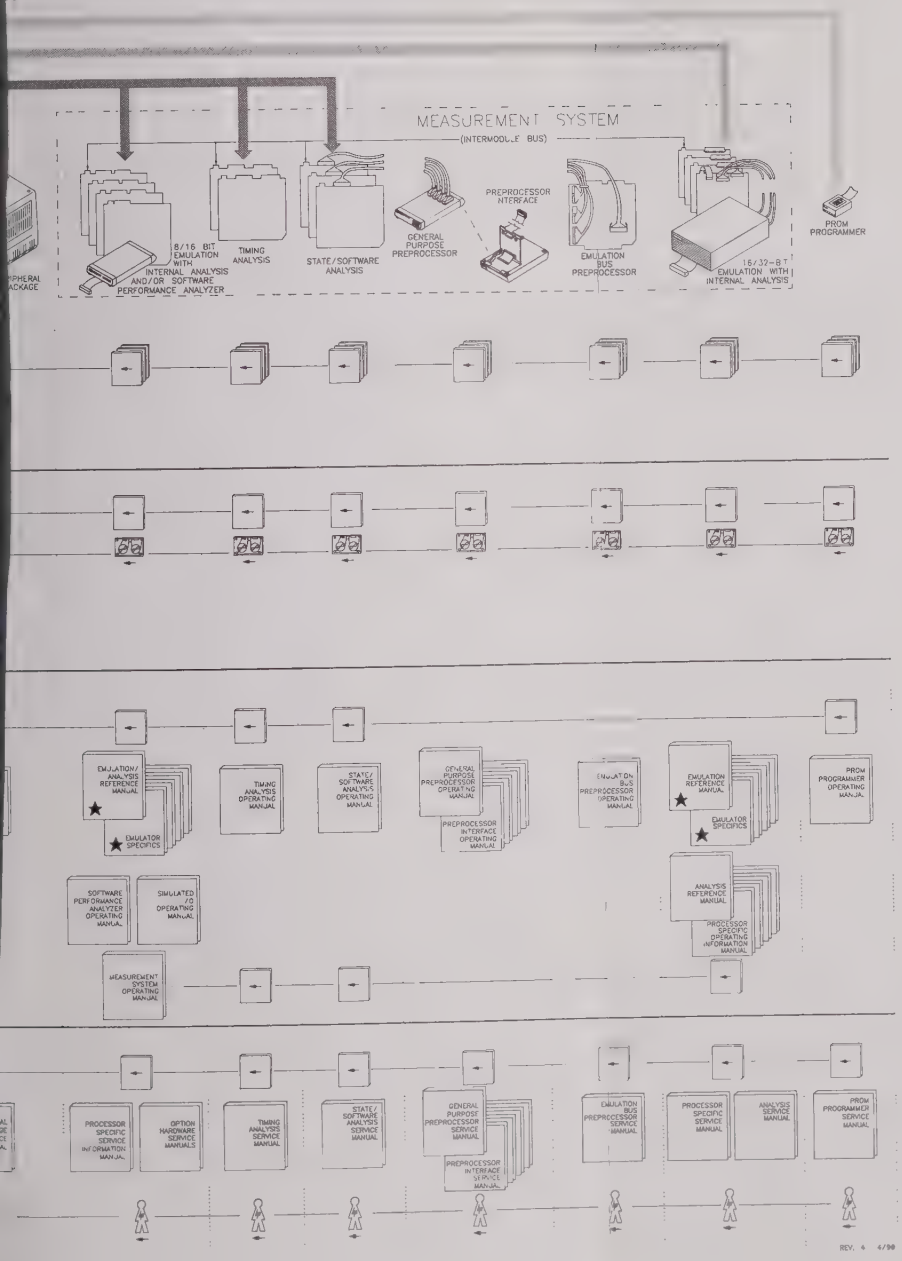
The manual:

- Helps you choose the configuration best suited to your needs.
- Shows you how to set the data communications switches to achieve the desired configuration.
- Shows you how to connect power and verify emulator operation.
- Shows you how to connect to your target system and other instruments.
- Gives you examples of installations using various pieces of HP equipment.

The manual does not:

- Tell you exactly how to connect to every possible piece of RS-232/RS-422 equipment manufactured by anyone (such a discourse could use up several volumes!).
- Tell you how to operate the emulator (refer to the *HP 64700 Emulator User's Guides*).

& SW INTEGRATION TOOLS



HP 64000-UX MANUAL MAP

Effective for HP 64000-UX Microprocessor Development System
Manuals printed after December 1986

HOW TO USE THIS MAP

Tasks are listed down the left-hand side of the rows. Hardware and software are shown along the top of the columns. Row/column intersections show the manuals you need when performing the tasks using the hardware and software.

EXAMPLE: All manuals needed to use an emulator are shown at the intersection of the USE row and EMULATION column. Further, the emulation reference manual is in the same binder with the processor-specific manual for your emulator.

KEY

= Use the manual(s) pointed to by the arrow when performing the task (on the left) with the product (shown above)

= Indicates manuals contained in same binder

= HP 9000 Reference Manuals may need to be used

= Software installation Manual includes information for the product shown above

= Low energy, fast efficient reliable, results-oriented HP Customer Support Staff

★ = For some emulators, the contents of the two manuals shown here are combined into one manual.

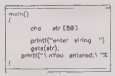
▲ = Automated version for hardware and software system installation

Conversion Kit = Makes an existing HP 64100A or HP 64110A station into an HP 64000-UX supported package consisting of a terminal, cardcage, and flexible disc drives (if drives were part of the original product)

Peripheral Package Operation = Shows you how to operate the parts of your converted HP 64100A or HP 64110A station

SOFTWARE DEVELOPMENT TOOLS

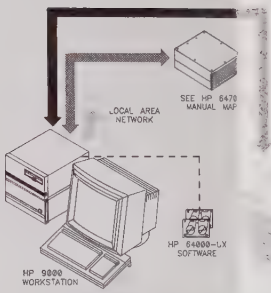
HW



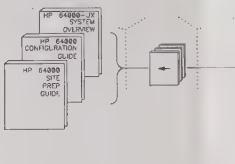
HP 64000
COMPILERS

HP 64000
ASSEMBLERS/
LINKERS

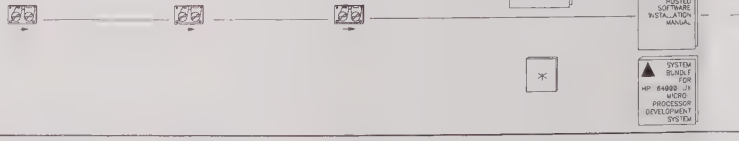
HP 64000
BBA/
DEBUGGERS



PRE-INSTALLATION

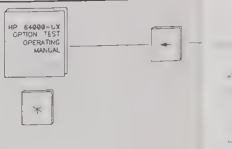


HW & SW INSTALLATION

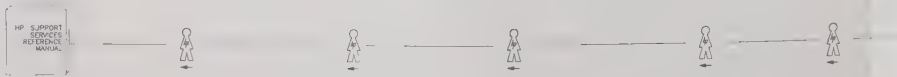


USE

TEST AND REPAIR



If All Else Fails:



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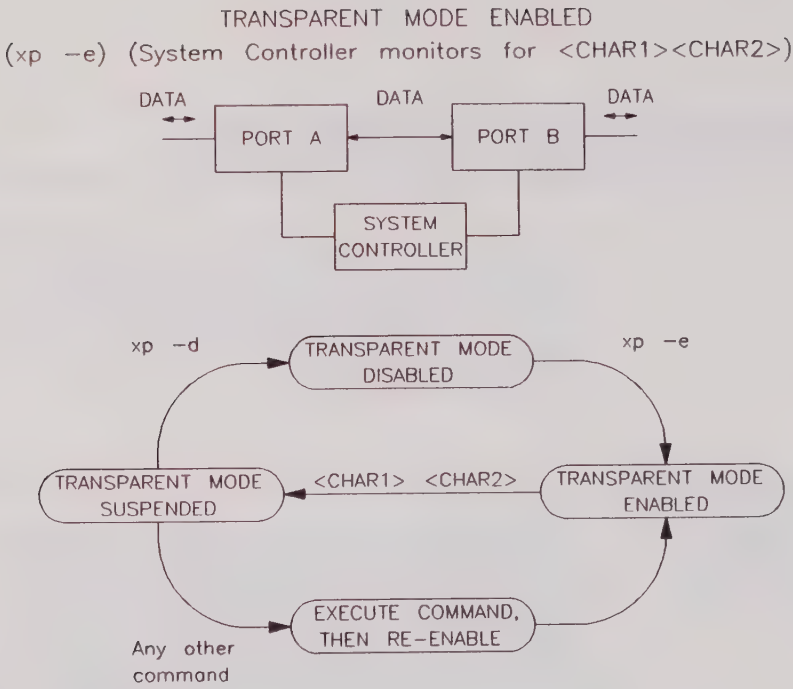
Choosing an Emulator Configuration

Before you proceed with installation of your HP 64700-Series Emulator, you need to decide how you will configure the emulator with your terminals/host computers and peripherals. This chapter shows you various HP 64700 configurations so that you can select the best one for your needs.

HP 64700 Data Communications Overview

Each HP 64700-Series Emulator has two data communications ports that can be configured to receive commands. The one labeled Port A is the Main data communications port and can be used as a DTE (Data Terminal Equipment) device or as a DCE (Data Communications Equipment) device. The one labeled Port B is the auxiliary data communications port and can only be used as a DCE device. In addition, Port A can act as an RS-232 or RS-422 device; Port B can only act as an RS-232 device. Each port allows certain handshake parameters to be set and allows a variety of baud rates (although Port B is more restricted than Port A in this regard).

One of the unique features of the two ports is that you can configure them into a transparent mode. When operating normally, data passing through Port A is independent of that passing through Port B and vice-versa. However, when you give the emulator a command called **xp -e**, the emulator is put into transparent mode. When in transparent mode, all information received by Port A is sent directly to Port B and vice versa. The data is monitored by the HP 64700 system controller but not acted upon until a two-character escape sequence (either **<ESC> g** or one defined by you) is encountered, when the emulator temporarily suspends the transparent mode communications.



NOTE: xp -d, xp -e, and <CHAR1> <CHAR2> are the terminal interface commands to disable, enable, and suspend transparent mode.

Figure 1-1. Transparent Mode Operations

You may then enter an **xp -d** command, which completely disables transparent mode; or, you may enter another emulator command, which is executed by the emulator before returning to transparent mode. See figure 1-1 for more information on transparent mode.

Note

Throughout this chapter, when you see HP 64700 ports labeled "A" and "B" in a diagram, these correspond to Port A and Port B on the actual HP 64700. You should remember that the configurations could have ports A and B reversed, depending on your needs. For example, it is not necessary in every case to have Port A connected to a data terminal and Port B connected to a host computer. You could just as easily connect B to the terminal and A to the host (this, in fact, would be the preferred configuration).

The HP 64700-Series Emulators provide transparent mode operation so that you can control multiple HP 64700-Series emulators or other RS-232 peripherals without using more than one data communications port from your terminal or host computer.

Now that you have seen a description of transparent mode, you can read on and learn about each of the possible emulator configurations. Remember, in any given set of emulator configurations you may have these four different types of equipment:

- Data Terminals
- Host Computers (such as an HP Vectra personal computer or HP 9000/300 Series Computer running HP-UX)
- HP 64700-Series Emulators (possibly more than one)
- Peripherals (such as printers)

HP 64700-Series Emulator Configurations

Each of the possible general configurations presented concentrate on how you connect your HP 64700-Series emulator to controlling devices, such as data terminals and host computers. There are further subtleties of configuration that are possible, which we will point out later. However, when choosing a configuration, your overriding concern is the question of how to control your emulator, so that is the way we present the configurations.

Standalone Configuration

See figure 1-2. In Standalone Configuration, the following things are true:

1. Your HP 64700-Series Emulator is connected directly to a display terminal.

2. Your HP 64700-Series Emulator is not connected to a host computer.

This configuration allows you to control the emulator using the emulator's built-in Terminal Interface software.

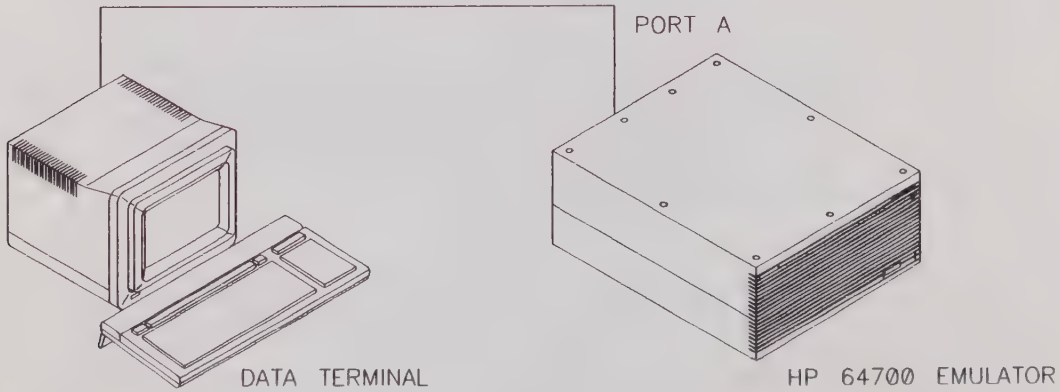


Figure 1-2. Standalone Configuration

Advantages are that you can control each emulator function directly, as the Terminal Interface allows you complete control over emulator operation. The disadvantage is that you do not have the resources of a host computer to use in assembling/compiling and downloading code into the emulator. You also do not have access to host computer resources, which would allow you to combine often used commands into command files, or save the emulator configuration into a host file for later re-use. You must have such host resources if you want to display timing measurements from the optional external analyzer.

Transparent Configuration

See figure 1-3. In Transparent Configuration, the following things are true:

1. Your HP 64700-Series Emulator is connected directly to a display terminal.

2. Your HP 64700-Series Emulator is also connected to a host computer.

In this configuration, you can use the emulator's built-in Terminal Interface software for emulator control. You now also have access to host computer resources by using the transparent mode operation of the HP 64700. This would allow you to compile and assemble program files on the host computer and download them into the emulator for testing. You can also save the emulator's configuration and then load it into the emulator at your next emulation session.

Finally, you need to run only one RS-232 data communications line to your location rather than two.

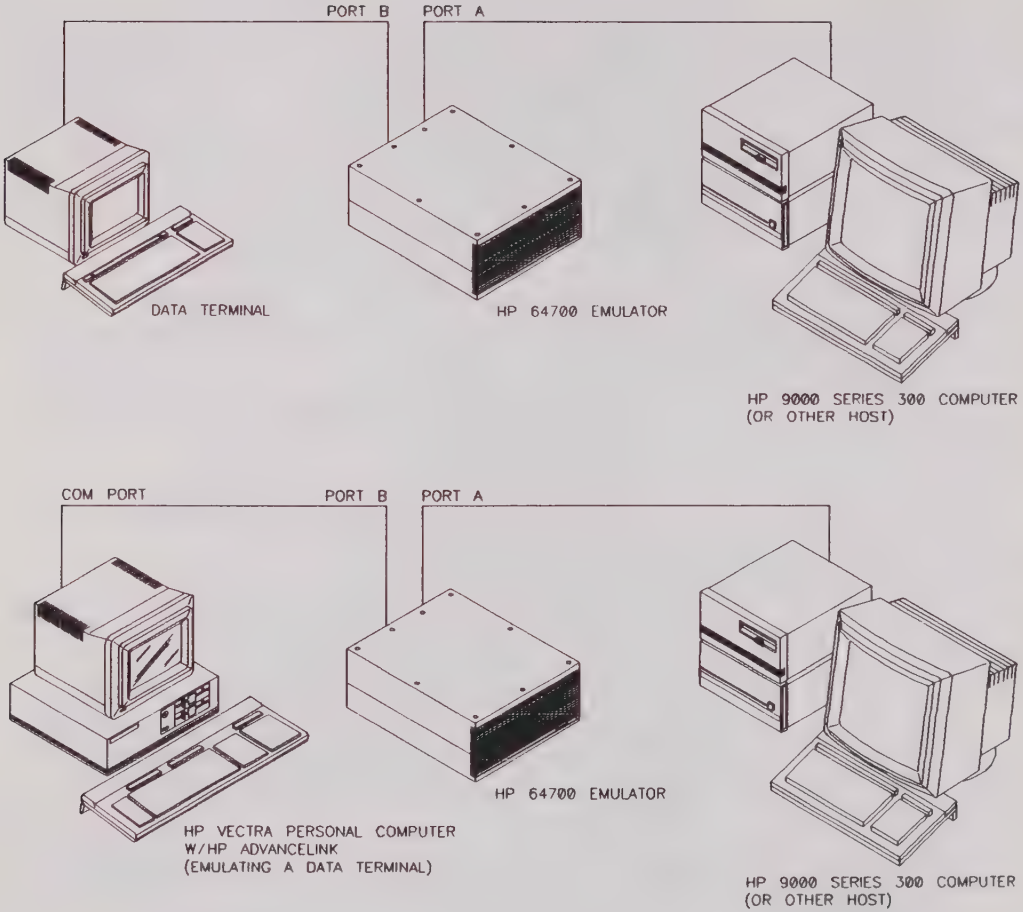


Figure 1-3. Transparent Configuration

Note

You should notice the difference between the terms Transparent Mode and Transparent Configuration. When we say **Transparent Mode**, we are referring to any time when Port A and Port B of the emulator are passing information directly through without processing the information as commands. When we say **Transparent Configuration**, we are referring to the specific hardware configuration where a data terminal is connected to one port of the HP 64700-Series Emulator and a host computer is connected to the other port.

Remote Configuration

See figure 1-4. In Remote Configuration, the following are true:

1. Your HP 64700-Series Emulator is not connected directly to a display terminal (or to any other form of I/O line connecting your display and keyboard to the host computer).

2. Your HP 64700-Series Emulator is connected to a host computer.

The preferred method of controlling your emulator in the Remote Configuration is to use one of the high-level software interfaces that HP has developed for the HP 64700-Series emulators. For the HP Vectra and other IBM PC-AT compatible personal computers running MS-DOS, you can use the HP 64700-Series PC Interface. For the HP 9000 Series 300 Computers, you can use the HP 64700-Series Softkey Interface, which provides an interface very much like the HP 64000-UX emulators. This interface frees you from entering several Terminal Interface commands to accomplish a particular function. In addition, the interfaces provide post-processing of data received from the emulator, allowing the display of timing information from the optional HP 64700 external analyzer and so on. Debugger interfaces are also available for use with the HP 64700-Series Emulators.

In this configuration, you could also control your emulator using the emulator's built-in Terminal Interface software. However, you will also need to have a data terminal emulation program running

on your host computer which has the ability to communicate with the host computer port you have chosen for the HP 64700 connection.

For example, if you decide to connect your HP 64700-Series Emulator to an HP Vectra personal computer, and are intending to control the emulator via the emulator's Terminal Interface Software, you would need a program such as HP's AdvanceLink software to communicate with the emulator.

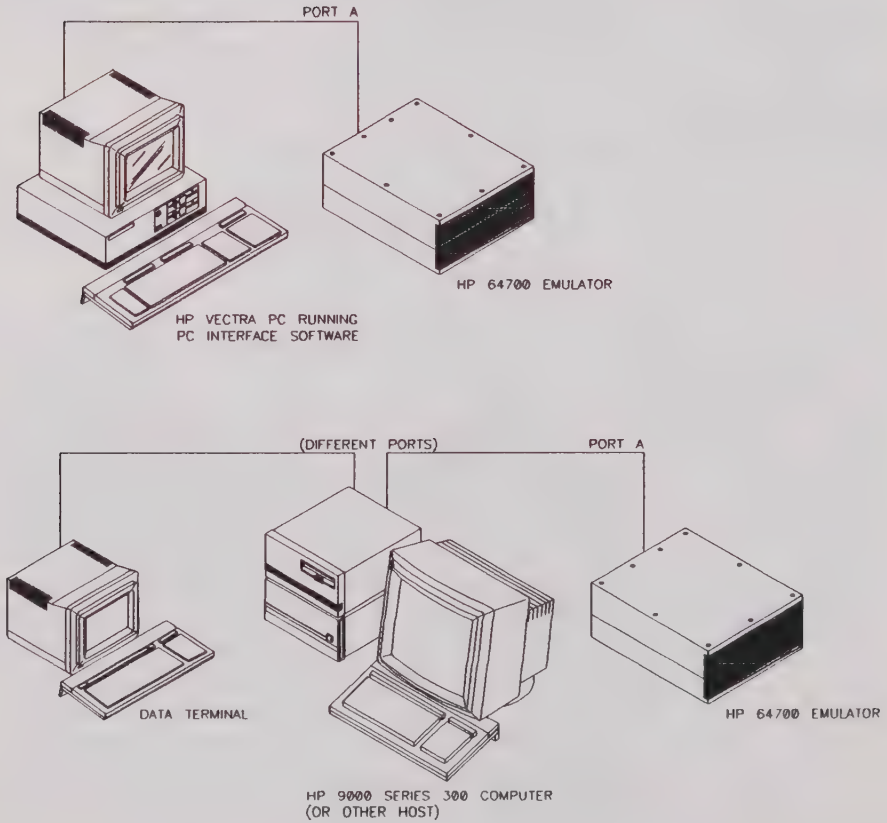


Figure 1-4. Remote Configuration

Using an HP 64100 Logic Development Station

In one variation on the remote configuration, you can use an HP 64100 Logic Development station in the terminal emulation mode to control the HP 64700-Series Emulator. Although you are restricted to using the HP 64700 Terminal Interface, you can develop code on the HP 64000 and download it to the emulator using the transfer utility.

Note

When using the terminal emulation mode on the HP 64000, you must set the terminal configuration option "Remote device input buffer size" to the value "512." Refer to the *HP 64000 Terminal Mode Operating Manual* for information on this and other Terminal Mode configuration items.

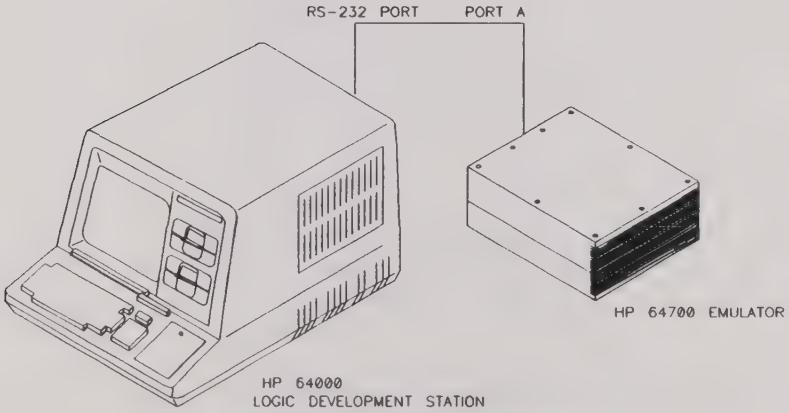


Figure 1-5. Using an HP 64100 Station

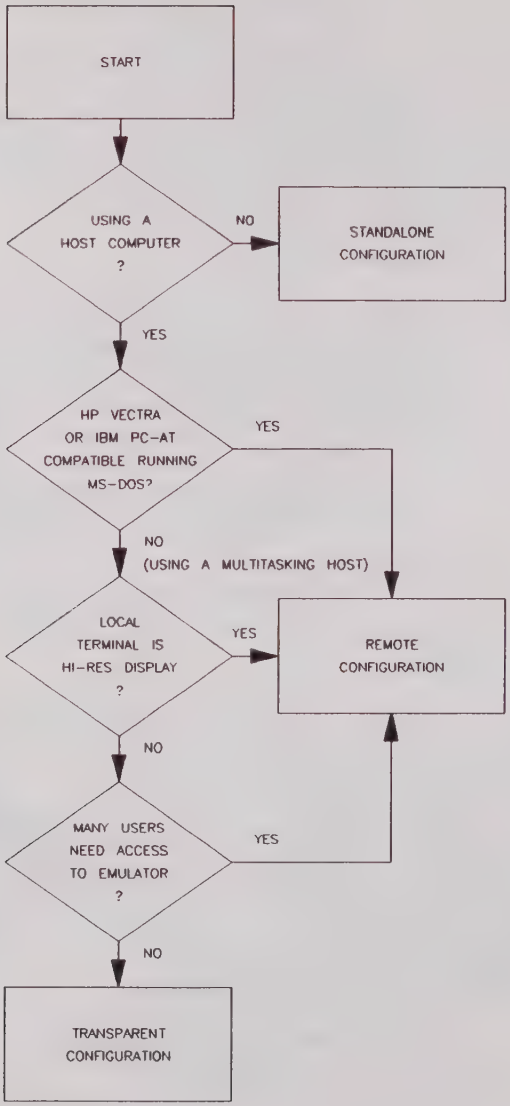


Figure 1-6. Configuration Choices Flowchart

Choosing a Configuration

You should now settle upon a general emulator configuration from one of the choices presented. You can ask yourself some questions which may help you come to a decision (see figure 1-6):

1. Do I have access to a host computer?

   If so, you should probably use the Transparent Configuration or the Remote Configuration. Either of these configurations allow you access to valuable host resources which can simplify your emulation and debugging tasks.

2. If I'm going to use a host, when should I use Transparent Configuration versus Remote Configuration?

If your host is an HP Vectra personal computer or other IBM PC-AT compatible running MS-DOS, you will have to use Remote Configuration.

If your host is an HP 9000 Series 300 computer running HP-UX, or another multiuser machine, the answer depends on the availability of display terminals and data communications ports for your system. For example, if your local display terminal is a high-resolution display for the HP 9000 Series 300 such as an HP 92782A, you cannot use the transparent configuration. Instead, you must use the remote configuration. However, if your local display terminal is a standard RS-232 type terminal such as an HP 2392A, you could use either configuration, depending on the number of free data communications ports, and your choices in controlling the emulator via the Terminal Interface Software or the Softkey Interface.

If you don't have access to a host computer, you must use at least a data terminal with a minimum set of RS-232 data communications capabilities to control your emulator.

Now that you've decided upon a configuration, you can proceed to chapter 2 and begin connecting your emulator data communications ports. However, you might want to know about some possible variations in configurations. These are described in the following section.

Variations of the Standard Configurations

Connecting Multiple Emulators

See figure 1-7. All the configurations listed above will support daisy chained connections (Port B of first emulator to Port A of second emulator, etc.), which allows you to connect several emulators to a terminal or host computer (or both) using only a single data communications port from the terminal or host. Through creative use of the **xp** command in the HP 64700 built-in Terminal Interface Software, you can selectively communicate with any emulator in the chain. Refer to the *HP 64700 CMB User's Guide* for more information and examples.

Connecting a Printer or Modem

See figure 1-8. To conserve RS-232 ports on your host or data terminal, you may wish to connect your host/data terminal to one of the HP 64700 ports and connect an RS-232 peripheral, such as a printer or modem, to the other port. By using the HP 64700 **xp** command, you can selectively direct communications from your controlling device to the printer or modem. Or, you may use the **po** command to redirect all output from an emulation session to a printer.

Note

You can only use this type of configuration if the base configuration is the Standalone Configuration or the Remote Configuration.

Note

You should use this configuration with caution when a host computer is connected to the HP 64700 in Remote Configuration. Other host processes, such as printer drivers, will not realize that the other device is not directly connected to the assigned port, and may generate errors if the HP 64700 was not put into transparent mode before those processes began. You might need to modify these programs to check the status of the device and generate the correct strings to put the HP 64700 emulator into transparent mode if necessary. Also, note that the escape sequences used to temporarily suspend the transparent mode of the HP 64700 may be used by some other device. You can redefine the escape sequences used by the HP 64700 so that they do not conflict with those used by the peripheral device. See the **xp** syntax pages in the *HP 64700 Terminal Interface Reference* manual for more information.

You can also set up a configuration where the controlling device, such as host computer, is separated from the HP 64700 emulator by a pair of modems and a telephone link. You might use such a configuration in a factory setting where you need to monitor the operation of remote processors in hazardous environments.

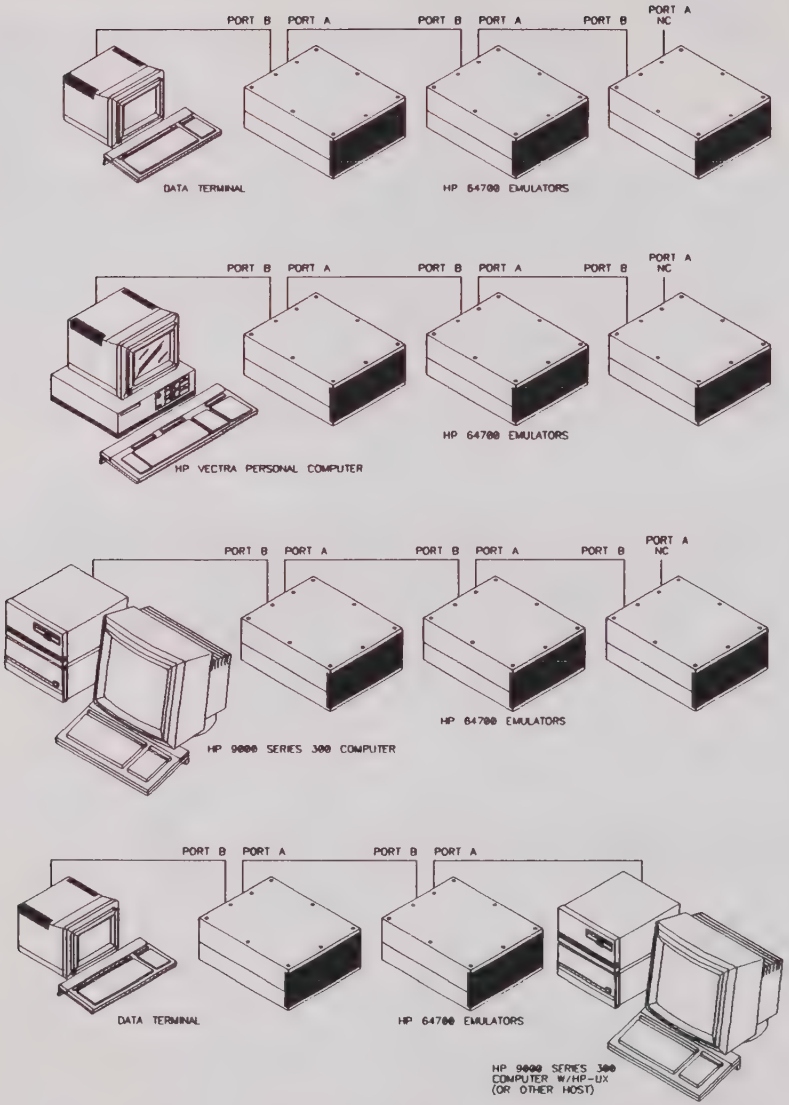


Figure 1-7. Using Multiple Emulators on One Data Link

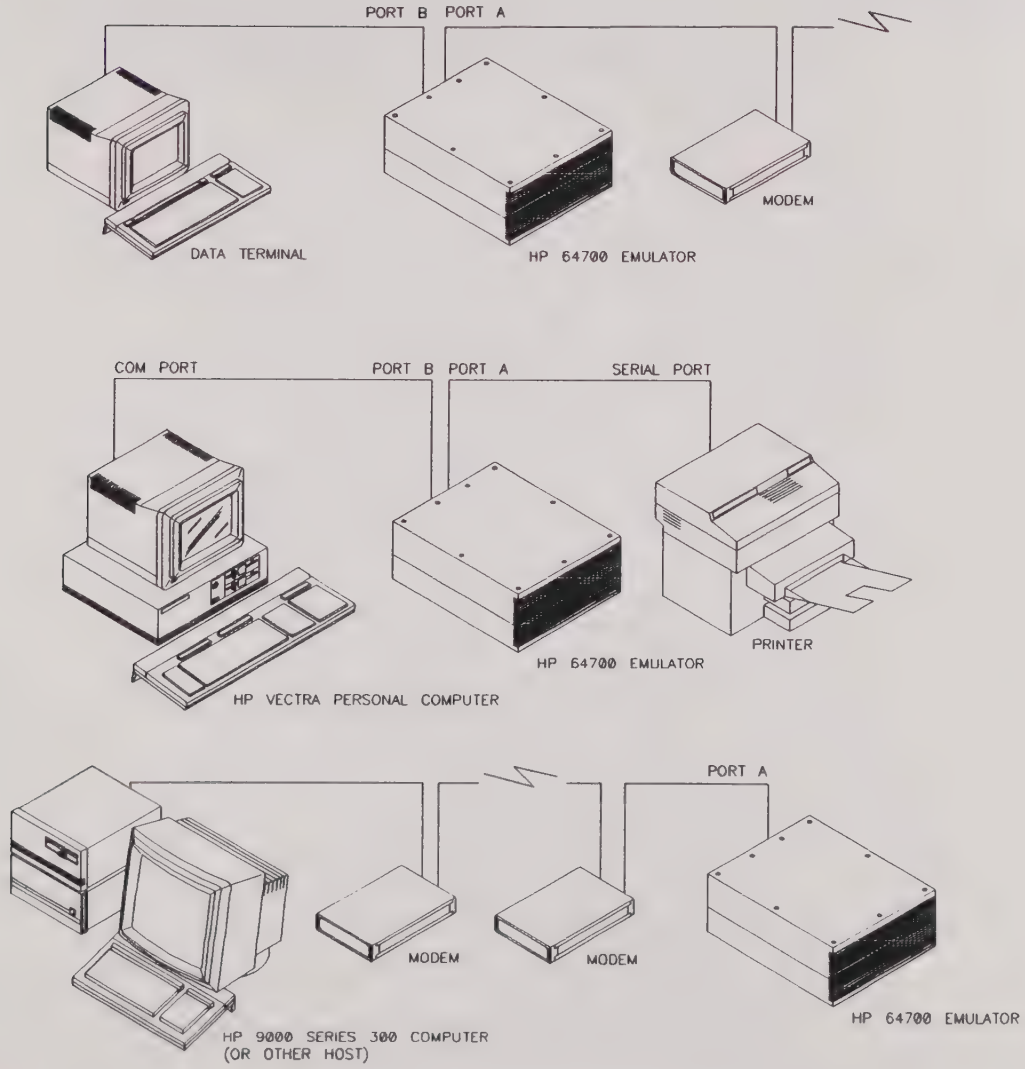


Figure 1-8. Using a Printer or Modem

Proceed Onward!

Now that you've chosen an appropriate configuration for your HP 64700-Series emulator, go to chapter 2 to learn how to hook up data communications cables and set the configuration switches.

Configure Data Communications

If you haven't determined the base configuration to use for your HP 64700-Series Emulator, refer to chapter 1. Then return here.

This chapter will give you some general information on how to connect the data communications cables between your HP 64700 emulator and a terminal or host computer or peripheral. It will also tell you how to set the data communications switches to obtain various communications configurations. Although we cannot cover all possible installation scenarios, the information provided should enable you to hook up to your terminal or host computer after doing some research into their data communications characteristics.

This chapter is not a tutorial on basic data communications principles. The book *Touring Datacomm: A Data Communications Primer* should help refresh you regarding RS-232 principles. This book is available under HP Part Number 5957-4622 from HP's Direct Marketing Division. Another book that you may find helpful is *The RS-232 Solution*, which you can order from HP under the product number 92234X.

In connecting to various data terminals and host computers, you will need access to their reference manuals, so that you can determine their default data communications configurations and either change them as necessary, or modify the HP 64700 data communications parameters to meet their needs.

Figure 2-1 shows the rear panel of the emulator and points out the location of the data communications ports and the data communications switches. Table 2-2 (at the end of this chapter) is a complete table of all the possible data communications switch settings for the HP 64700-Series Emulators.

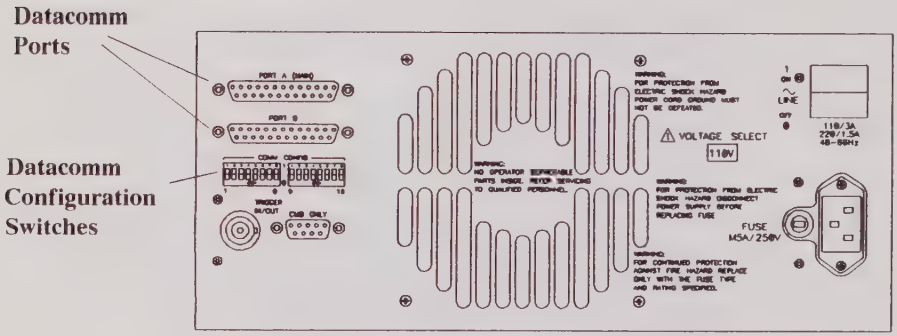


Figure 2-1. Datacomm Port and Switch Location

Which Port Do I Use?

If you are connecting a single device, such as a terminal or host computer, to the HP 64700-Series emulator, use Port A because this will provide you with the greatest data communications flexibility.

If you are connecting two devices to the HP 64700-Series emulator, the port you will use to connect each device depends on whether:

- The device you are connecting to the HP 64700 uses RS-232 protocol or RS-422 protocol.
- The device you are connecting acts as a DTE (Data Terminal Equipment) or a DCE (Data Communications Equipment) device.

Here are some examples of decisions you might make regarding choices of ports:

1. You need to connect an RS-422 interface on a host computer to the HP 64700 emulator and you are also connecting an RS-232 printer to the HP 64700. Here, use port A to connect to the host, as it is the only port which supports RS-422 communications. Then, you will connect Port B to the printer. You should also note that, since most printers are DCE devices, you will need a null modem cable to connect Port B to the printer.

2. You need to connect a terminal to one port of the HP 64700 and a host computer to the other port. Both devices use RS-232 interfaces. You can choose either port A or port B for either connection. However, since most host computer interfaces act as DCE devices, you can avoid the need for a null modem cable by connecting port A to the host (and configuring it as a DTE device), then connect port B to the terminal.

You can use the same sort of configuration if you wanted to connect a data terminal and a modem to the HP 64700. Modems act as DCE devices, so you would hook the modem to port A and the terminal to port B.

Note

You will want the device which controls the emulator to act as a DTE device; therefore, you will want to hook into a port on the HP 64700 which will act as a DCE. Your decision here is whether you need another HP 64700 port to act as a DTE. If so, you should connect the controlling device to port B and the other device to port A to avoid the need for a null modem cable.

Once you have determined which port will go to which devices, you may need to make the following configuration switch changes on the rear panel of the HP 64700:

1. If you are using Port A as an RS-422 port, set configuration switch S5 to a one (1). See figure 2-2.

2. If you need to have Port A act as a DTE device, set configuration switch S4 to a one (1). See figure 2-3.

Note

You cannot have port A act as an RS-422 device and a DTE device simultaneously. If you select port A to be an RS-422 device, it operates as a DCE device, and the setting of the DCE/DTE switch is ignored.

---

3. **If you are connecting the controlling device in your system to Port A, set configuration switch S6 to zero (0). However, if you are connecting the controlling device to port B, set switch S6 to one (1).** See figure 2-4.

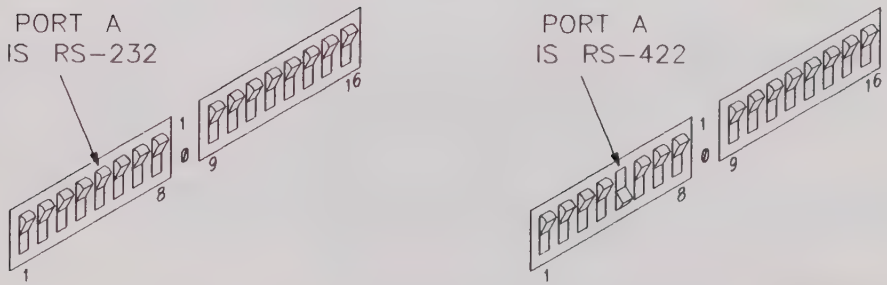


Figure 2-2. RS-232/RS-422 Configuration Switch

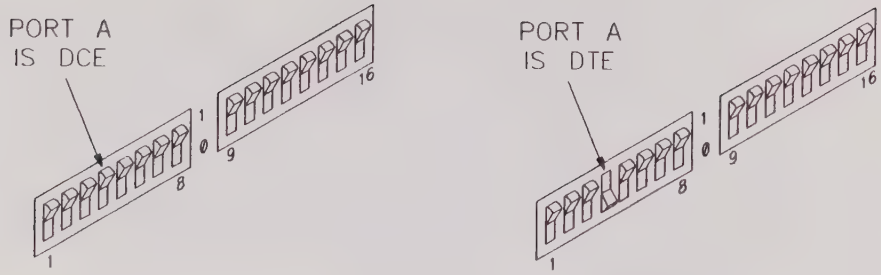


Figure 2-3. DCE/DTE Configuration Switch

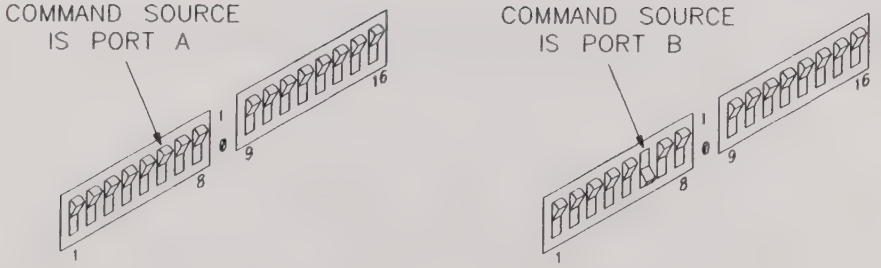


Figure 2-4. Command Source Configuration Switch

How Do I Set Baud Rate?

Your next step in the data communications installation process is to set the baud rate for each port and for the associated terminals, host computers, and peripherals.

In the HP 64700-Series Emulators, port A can support various baud rates from 300 to 460800 baud (although anything above 19200 baud will usually work reliably only with an RS-422 interface). Only baud rates from 1200 to 230400 are selectable using the switches. The others may be selected using the Terminal Interface **`stty`** command (refer to the *Terminal Interface Reference* manual). Port B supports various baud rates from 300 to 38400 baud. Only baud rates from 1200 to 19200 are switch-selectable. The others may be set using the **`stty`** command.

Note

All combinations of Port A and Port B baud rates are allowed except in the situation where one port is set to 19200 baud and the other port is set to 38400 baud. If you try to set such a combination, one of the ports will actually be set to a baud rate other than the one you requested.

Before you can set the baud rates, you need to determine the best balance of rates for your system. Let's look at some examples.

1. Assume you have a personal computer with a terminal emulation program connected to port B of the HP 64700, and that a 1200 baud modem is connected to port A. You only use the modem occasionally to dial up a minicomputer and download code. Otherwise, your primary interaction is with the HP 64700 emulator. Therefore, you should set the baud rate on port A to 1200 and the baud rate of port B to the maximum rate possible with your computer. Because most versions of MS-DOS do not support baud rates greater than 9600, you should set port B to 9600. Whenever you need to use your data communications program to communicate with the minicomputer, you can put the HP 64700 emulator into transparent mode so that you are communicating with the modem.

Note

You will not need to alter the baud rates of either port to match the other when you use transparent mode, as long as you use some form of handshake (see "Setting the Handshake" later in this chapter. If you do not use any handshake protocol, then you will need to alter the baud rate of one of the ports to match the other when using transparent mode. (Use the **`stty`** command to alter baud rate during operation.) This will prevent loss of data due to a data overrun (buffer fills faster than the controller can process the data).

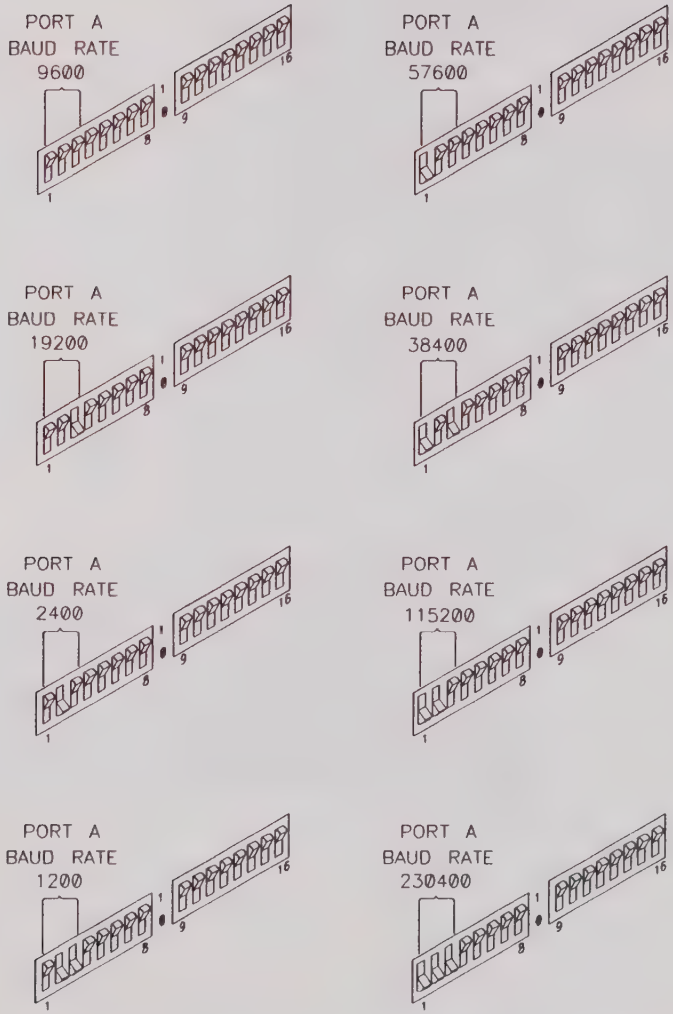


Figure 2-5. Port A Baud Rate Configuration Switches

2. If you are using only one of the HP 64700 ports, controlled by a data terminal or host computer, the best technique is to set the HP 64700 baud rate to the maximum value, allowing reliable communications between the terminal or host and the HP 64700. For RS-232 links, this will generally be a maximum of 19200 baud. RS-422 links, because of their balanced lines, will generally support datacomm up to the maximum port A baud rate of 460800.

   For most HP terminals using RS-232 links, you can run at a maximum of either 9600 or 19200 baud depending on the terminal model. Most HP personal computers support baud rates of either value dependent on the version of MS-DOS installed. HP 9000 Series 300 computers will support either maximum depending on the interface card installed.

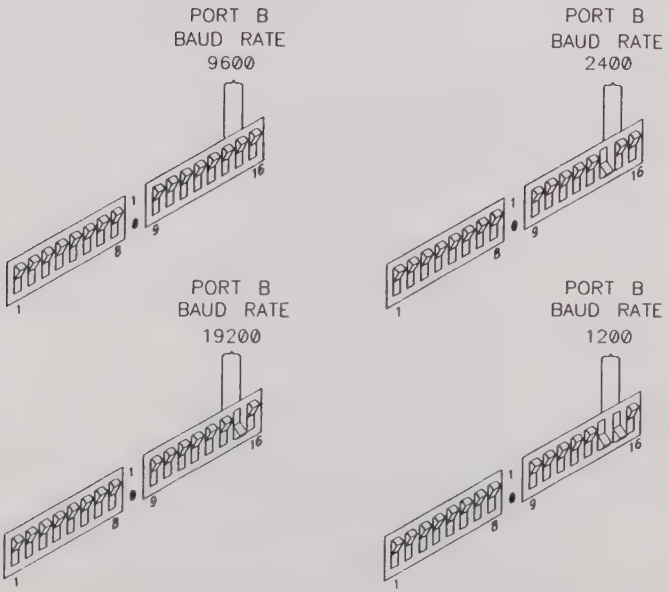


Figure 2-6. Port B Baud Rate Configuration Switches

Note

Certain HP 9000 Series 300 RS-232 and RS-422 interface cards have their own configuration switches, which you will need to set before you install the card in the computer. Refer to the documentation for the interface card and to the HP-UX system documentation for more information.

3. If you are using both HP 64700 ports in the Transparent Configuration, where one port is connected to a host computer and the other port is connected to a data terminal, you should generally select a baud rate for both ports that is the same as the one you would use if your terminal was directly connected to the host computer. For example, if you are using an HP terminal with an HP 9000 Series 300 computer, you would set the baud rates for both ports to either 9600 baud or 19200 baud depending on the interface installed in the computer.

When you have decided upon a baud rate setting for each port, set the HP 64700 rear panel configuration switches (S1..S3 for port A, S14..S15 for port B) to the necessary values. Refer to figures 2-5 and 2-6 and table 2-2 for exact information regarding the switch settings necessary for each baud rate. Once you have set the baud rate for the HP 64700, make sure that the baud rate settings are identical on the devices you intend to connect to each port.

Taking a Shortcut

If you're in a hurry to use your emulator, you can ignore the rest of the information here and set the other datacomm switches later as needed to resolve specific communications problems. Skip to the next section in this chapter entitled "Selecting and Connecting Cables." However, if you're not very familiar with data communications, we suggest you continue with the next section.

Setting the Handshake

Different devices use different ways of controlling the stream of data through the interface. These are called handshakes. The HP 64700-Series Emulator may be preset to four different types of handshake as described in the following.

No Handshake

Devices connected to the HP 64700 must be able to receive data as fast as it is sent.

XON/XOFF Handshake

This software handshake uses the characters DC1 and DC3 to tell other devices to "start transmission" or "stop transmission." When its receive buffer is 3/4 full, the HP 64700 will send a DC3 (XOFF) character to tell the other device to stop transmitting data. After it has processed 1/2 of the data in the buffer, it will send a DC1 (XON) character to tell the other device to resume transmission.

RTS/CTS and DSR/DTR Handshake

The hardware handshake uses the control lines on the RS-232 interface to control the flow of information. The definition and use of the control signals have been modified from the RS-232 standard. There are a limited number of interface cards which support this modified handshake. They include the HP 98659A RS-422 High-Speed Interface, the HP 64037A PC High-Speed RS-422 Interface, and the built-in RS-232 interface in the HP 9000. When hardware handshaking is enabled, these lines operate as described in the following sections.

When HP 64700 is Set Up as a DTE Device

DTR is output at powerup to indicate that the emulator is available. DSR is ignored. The Clear To Send signal (CTS) is used to control output. The HP 64700 receives CTS, and will only output data when CTS is true. The DCE can stop the HP 64700 from sending data by setting CTS false.

The Request To Send signal (RTS) is used as a reverse channel CTS to control the output of the remote DCE. When the HP 64700 has a full input buffer, it sets RTS false. When it is able to again receive data, it sets RTS true. This provides bidirectional hardware control of the data streams.

When HP 64700 is Set Up as a DCE Device

DSR is output at powerup to indicate that the emulator is available. DTR is ignored. The HP 64700 sends CTS when the buffer is full. The HP 64700 uses receipt of the Request To Send signal (RTS) to control outputting data.

Hardware handshaking is supported for RS-232 and RS-422 on port A. Port B only supports RS-232, but also supports hardware handshaking.

XON/XOFF, RTS/CTS and DSR/DTR Handshake

This handshake method combines the former two methods to allow complete hardware and software control of information flow across the interface.

The type of handshake you use depends to a certain extent on the type of cable you use. If you are using a three wire RS-232 connection (transmit, receive, and ground), you are restricted to no handshake or an XON/XOFF handshake.

Note

You should generally choose XON/XOFF as the minimum handshake level if supported by the other devices in your configuration. This ensures that data is not lost if the controlling device can dump data in larger blocks than the HP 64700's system controller can handle, or vice versa. Setting the handshake is especially important if you use the emulator in a transparent configuration where Port A and Port B are set to different baud rates.

If you are using the recommended HP data communications cables, you may use all the hardware handshakes as well.

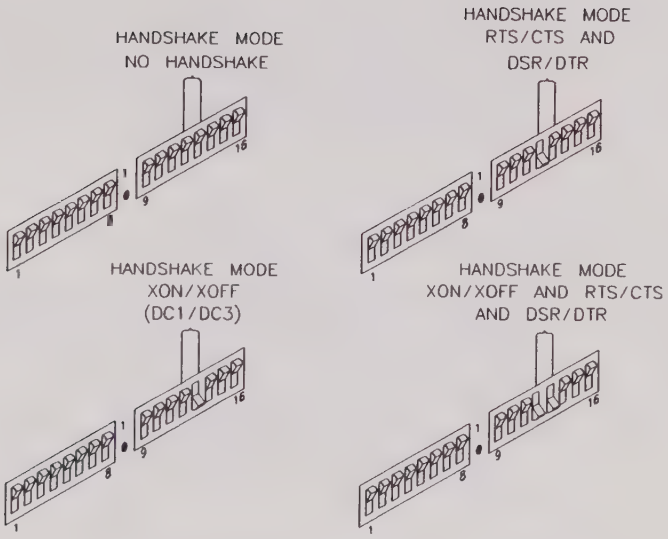


Figure 2-7. Handshake Configuration Switches

Note

If you choose to use the hardware handshake (whether or not in conjunction with the software handshake), you must connect the HP 64700 emulator to devices which also support hardware handshake. If these devices do not support hardware handshake, the HP 64700 emulator will fail to complete its power up sequence. Here, you should change the handshake configuration to use the software handshake only or no handshake as appropriate.

You may need to refer to the manuals supplied with your data terminals, host computer, or peripherals to determine the handshakes supported.

Once you choose a handshake method, set the HP 64700 rear panel configuration switches to the desired handshake. See figure 2-7 and table 2-2 for detailed information on the proper switch settings for each handshake type. You will also need to configure your other devices to the correct handshake type.

Setting Parity

When you set parity output, each byte transmitted by the HP 64700 will have an additional parity bit added to show the proper parity to the receiving device. This provides error checking for each byte transmitted.

You can enable or disable parity output by the HP 64700. If enabled, you can set the HP 64700 to output odd parity or even parity.

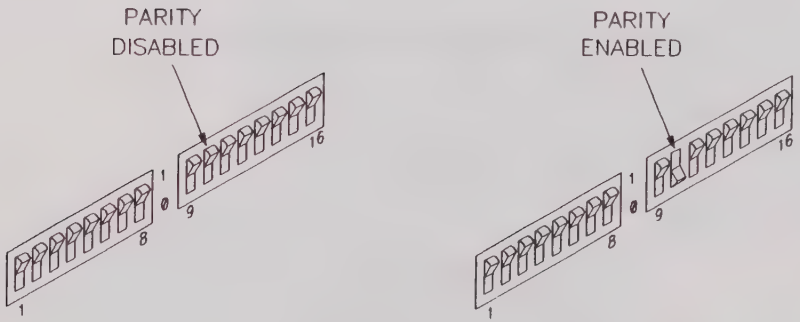


Figure 2-8. Parity Disable/Enable Configuration Switch

Whether you set parity output depends on the devices you use with the HP 64700. For example, many host computers require some form of parity checking. You should refer to the manuals for these associated devices to determine their parity check requirements. Remember that if you are using multiple devices with the HP 64700-Series Emulator, you need to match parity checking on both devices. For example, if you set even parity output on the emulator to be compatible with a host computer, a data terminal attached to the other port should also be set to even parity.

After you have determined the correct parity configuration, you can set the HP 64700 rear panel configuration switches. See figure 2-8 for the parity switch settings.

If you want to enable parity output, set switch S10 to a one (1).

If you have enabled parity output, you can set the HP 64700 to output odd parity by toggling switch S11 to a zero (0). To output even parity, set switch S11 to a one (1). See figure 2-9.

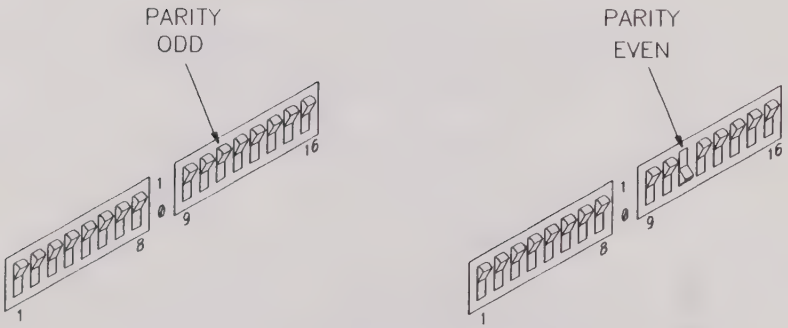


Figure 2-9. Parity Odd/Even Configuration Switch

Setting the Character Length

Devices that you might use with the HP 64700-Series Emulator may differ in the number of bits they transfer to represent each ASCII character. Although only 7 bits are required to transmit the ASCII character set, many manufacturers of data terminals, host computers, and printers use the eighth bit to extend the ASCII character set with another 128 characters. It is important for the HP 64700 to send and receive characters with the proper number of bits so that characters are represented correctly. Some examples of differing character sets include:

1. Most UNIX systems send and receive 7-bit characters. These include systems such as HP-UX running on HP 9000 Series 300 computers. However, some applications in an HP-UX computer may use 8-bit characters to represent certain foreign language characters.

2. Personal computers running the MS-DOS operating system have standardized on the IBM PC-8 character set. This is an 8-bit character set.

3. Hewlett-Packard printers are standardized on an 8-bit character set known as Roman-8.

4. Most all other systems will use only the standard 7-bit ASCII character set.

Note

If you intend to use a binary transfer protocol (such as the HP 64000 **transfer** utility) to transfer programs or trace listings between a host computer and the HP 64700 (or another device connected to the other HP 64700 port), you must set the HP 64700 emulator to send and receive 8 bits.

You may need to refer to the manuals for the other devices used with your system (data terminals, host computers, printers, etc.) to determine the correct number of bits used by the device. Remember that you should set all devices to the same number of bits per character; for example, if your host computer uses 8 bits per character, and you are using the HP 64700-Series Emulator in the Transparent Configuration, you should set the HP 64700-Series Emulator and the data terminal to 8 bits per character.

Once you have determined the correct number of bits per character, set the HP 64700-Series Emulator rear panel configuration switch to the correct value. See figure 2-10 for the switch settings.

If you want the HP 64700 to send and receive 7 bits per character, set switch S9 to a one (1).

If you want the HP 64700 to send and receive 8 bits per character, set switch S9 to a zero (0).

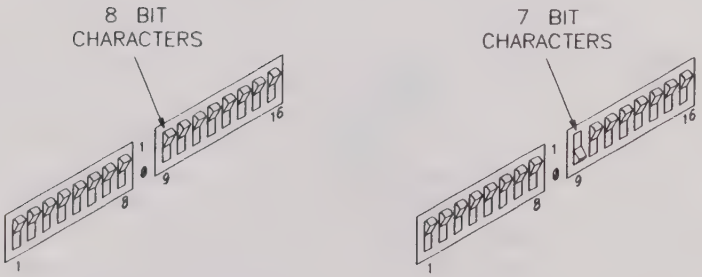


Figure 2-10. Character Length Configuration Switch

Setting Local Echo

When you type characters on a keyboard, some piece of software needs to send the characters received to your display screen so that you can monitor what you have typed. This is known as "echoing" the characters. Each system handles echo in different ways. For example, in most Hewlett-Packard computer systems, the host computer automatically echoes characters typed in at a data terminal. Even though HP data terminals provide an echo function, the correct configuration at the data terminal is to disable the local echo. Otherwise, every character typed at the keyboard would appear twice on the display screen.

Each HP 64700-Series Emulator provides a configuration switch to enable or disable its echo function. If enabled, each character received by the HP 64700 is echoed back on the same port as received. If disabled, the characters received are not echoed back. With Hewlett-Packard computers, you will normally want to enable the local echo function. See figure 2-11.

You normally want to have the active device furthest from your input echoing back characters. This provides you with feedback that the receiving system is receiving characters. For example, in Standalone Configuration, you would want to have the HP 64700 echo function enabled and the data terminal's echo function disabled. Then, if anything goes wrong with the data communication cable or with the HP 64700, you will be immediately aware of a problem since character echo will cease. Conversely, if you enabled the data terminal's echo function and disabled it on an HP 64700, you might not be aware of such a failure. (Although the HP 64700 would cease sending command prompts or requested information to the data terminal, anything you typed in would echo.)

You might need to refer to manuals for your other devices to determine your need for echo. A good way to determine your echo requirements is to draw out your configuration and show which devices automatically echo characters as part of their system software and cannot disable echo. Then look at other devices in the chain and determine whether they will need to echo characters back to other devices.

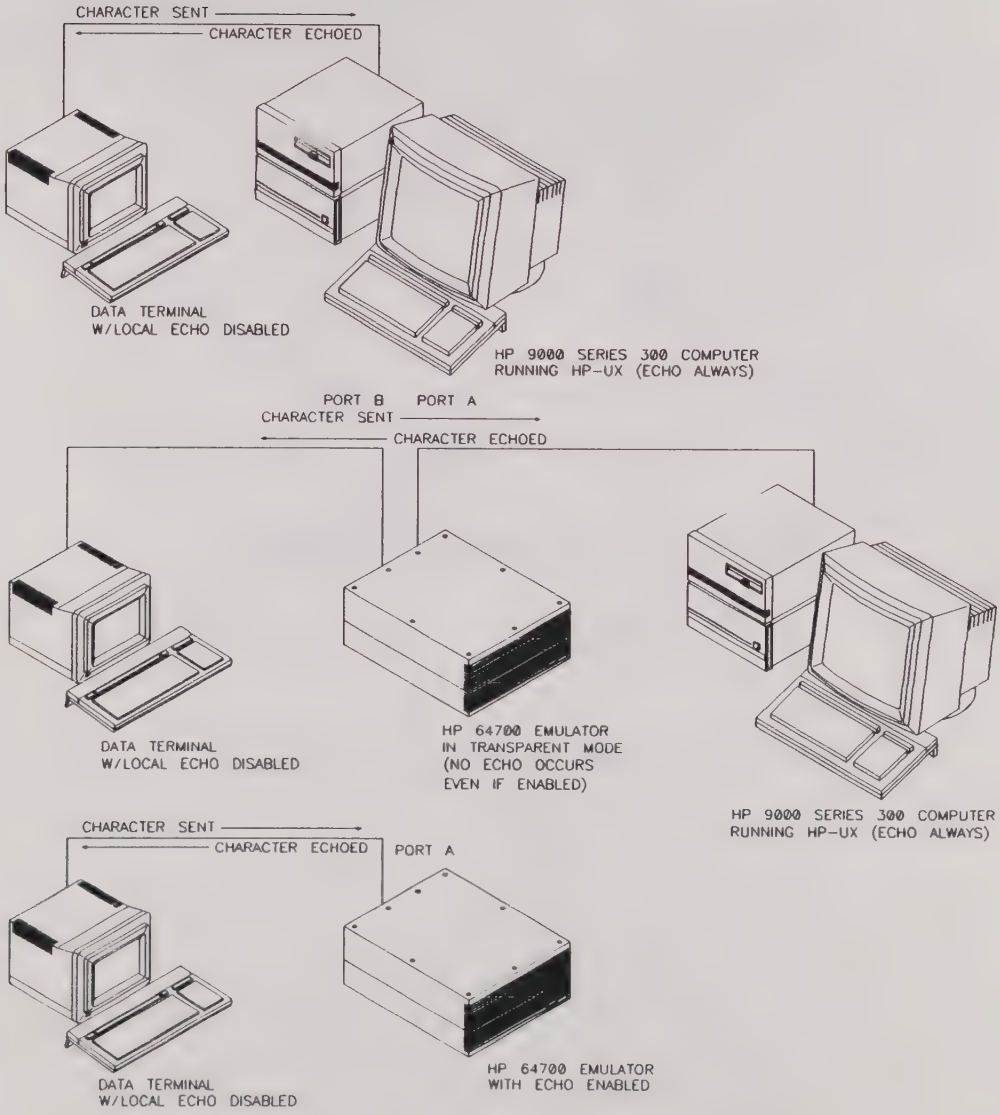


Figure 2-11. Echoed Characters in Your System

Once you've determined the need for echo, set the rear panel configuration switches on the HP 64700. See figure 2-12.

1. If you need to have the HP 64700 echo characters received (on either port), set switch S8 to zero (0).

2. If you don't want the HP 64700 to echo characters received, set switch S8 to one (1).

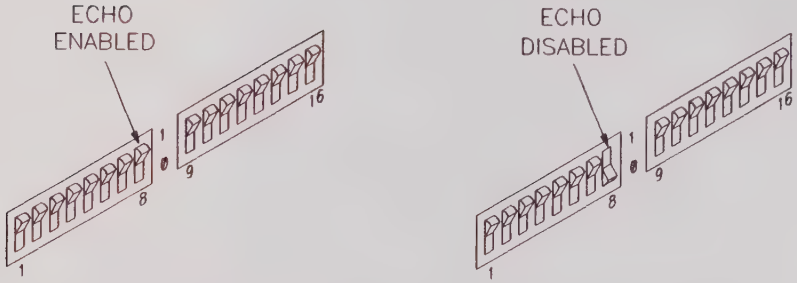


Figure 2-12. Echo Enable/Disable Configuration Switch

Transparent Mode Upon Powerup

If you are using the HP 64700 emulator in a Transparent Configuration, or in any configuration where you have another device connected to the second data communications port, you may want the HP 64700 to be in transparent mode whenever it powers up, until otherwise modified by you using the Terminal Interface **xp** command. You would normally do this if you spend most of your time working with the other device, rather than the emulator.

1. If you want the HP 64700 to be in transparent mode upon powerup, set rear panel configuration switch S7 to one (1). See figure 2-13.

2. If you don't want the HP 64700 to be in transparent mode upon powerup, set switch S7 to zero (0).

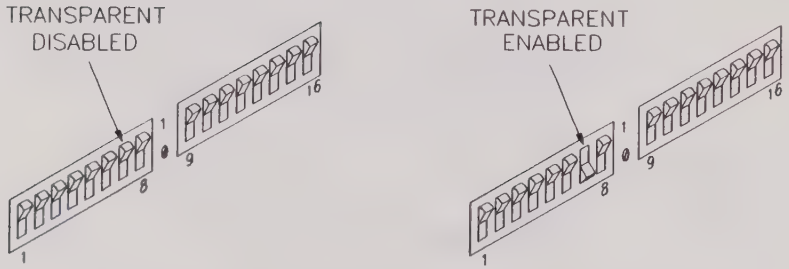


Figure 2-13. Transparent Disable/Enable Configuration

Overriding the Configuration Switches

After your system has powered up, and you can communicate with the HP 64700 emulator through a controlling device, you can change any of the data communications parameters assigned to either port using the Terminal Interface **stty** command. The primary goal of the hardware configuration switches is to have the system come up in a state where you can access and modify the HP 64700 Terminal Interface. Refer to the *Terminal Interface Reference* manual for information on the **stty** command.

Selecting Cables

Now that you have set the powerup configuration, you need to choose the proper cables to connect your devices to the HP 64700-Series Emulator. Refer to table 2-1 for a list of supported cable types for the devices listed. Cables not listed in table 2-1 have not been tested for compliance with RFI regulations, and therefore are not recommended.

Connecting Cables

To the HP 64700

To connect cables to the HP 64700, simply align the cable with the desired port (A or B) and insert the 25-pin male connector of the cable until it is firmly seated. You should then tighten the holding screws on each side of the cable with a small flat blade screwdriver. This will ensure that the cable pins and shield hood make good contact with the HP 64700 connector and will also guard against accidental disconnection of the cable. See figure 2-14.

Table 2-1. Recommended Cables for the HP 64700

TO CONNECT TO...	USING INTERFACE...	USE HP CABLE	HP 64700 PORT TYPE SETTING
HP Vectra Personal Computer and other IBM PC-AT compatibles	24540A/24541A - 9-pin connector or 24541A - 25-pin connector	24542M U.S. Modem Cable (3 meters), 13242N (5 meters), or 92218A (15 meters)	PORT A OR B DCE
HP 9000 Series 300 Computers	98628A or 98626A*	5061-4215 (DTE cable)	PORT A OR B DCE
	98561-66530*	98221M	
	98644A*	13242N (5 meters), 92218A (15 meters), or 92222M (0.2 meters)	
	98642A Mux ** (port 0 only)	92219S (5 meters)	
HP 239X Series Terminals	Standard	40242M (5 meters)	PORT A OR B DCE
Hewlett-Packard Printers (LaserJet, ThinkJet, QuietJet, etc.)	RS-232	17255M (1.2 meters) or 13242-60010 (5 meters) or 17255D (1.2 meters) or 92219J (5 meters)	PORT A DTE
Modems	Standard 25-pin female	13242N (5 meters)	PORT A DTE

* These interfaces have a one-byte buffer. They also do not provide an on-board software or hardware handshake for inbound data. Data loss can occur on input in a busy system if the aggregate baud rate for all single-byte-buffered interfaces is above 2400 bps, and the character rate is above 240 cps. If your application requires bursts of input data at high speeds, consider using the buffered HP 98628A or HP 98642A interfaces.

** If you experience problems with data loss while using an HP 98642A Mux card, contact your HP Sales and Service Office for assistance.

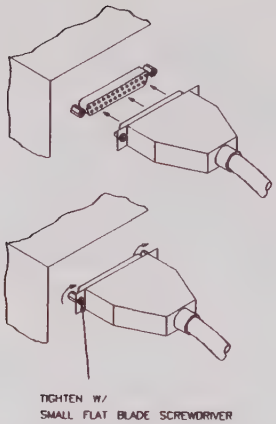


Figure 2-14. Connecting RS-232 Cables

To Other Devices

Refer to the installation manuals for the other devices you will be using with the HP 64700-Series Emulator to determine how to connect cables to those devices.

Table 2-2. Datacomm Switches

<table>
<tr><th>SWITCH</th><th>POSITION</th><th>FUNCTION</th><th colspan="4">DESCRIPTION</th></tr>
<tr><td rowspan="10">S1,S2,S3</td><td rowspan="10">See description.</td><td rowspan="10">Port A Baud Rate</td><td colspan="4">Sets baud rate of Port A after powerup.</td></tr>
<tr><td>S1</td><td>S2</td><td>S3</td><td>Baud Rate</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>9600</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>19200</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>2400</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1200</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>57600</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>38400</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>115200</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>230400</td></tr>
<tr><td>S4</td><td>0
1</td><td>Port A is DCE
Port A is DTE</td><td colspan="4">Selects whether Port A functions as DCE (data communications equipment) or DTE (data terminal equipment).</td></tr>
<tr><td>S5</td><td>0
1</td><td>Port A is RS-232
Port A is RS-422</td><td colspan="4">If 0 is selected, port A functions as RS-232. If 1 is selected, Port A functions as an RS-422 DCE device and the setting of S4 is ignored.</td></tr>
<tr><td colspan="7">Note: An adhesive label containing the information from this table is supplied with each HP 64700-Series Emulator.</td></tr>
</table>

Table 2-2. Datacomm Switches (Cont'd)

SWITCH	POSITION	FUNCTION	DESCRIPTION
S6	0	Command source is Port A.	Selects source of commands after powerup.
	1	Command source is Port B.	
S7	0	Transparent mode disabled at powerup.	Selects whether or not the HP 64700 "wakes up" in transparent mode. After powerup, the transparent mode may be enabled and disabled with the **xp** command.
	1	Transparent mode enabled at powerup.	
S8	0	Local echo enabled.	Selects whether or not characters sent to the HP 64700 are echoed back to the host. The switch controls echo for both Port A and Port B.
	1	Local echo disabled.	
S9	0	Send/receive 8 bits.	Determines the number of bits used to represent each ASCII character.
	1	Send/receive 7 bits.	
S10	0	Parity output disabled.	Determines whether or not parity output is enabled. If disabled, the state of S11 (parity mode switch) is a don't care.
	1	Parity output enabled.	
S11	0	Parity is odd.	Sets up parity output for odd or even parity. The position is a don't care if parity output is disabled by S10.
	1	Parity is even.	

Table 2-2. Datacomm Switches (Cont'd)

<table>
<tr><th>SWITCH</th><th>POSITION</th><th>FUNCTION</th><th colspan="3">DESCRIPTION</th></tr>
<tr><td rowspan="6">S12, S13</td><td rowspan="6">See description.</td><td rowspan="6">Handshake mode.</td><td colspan="3">S12 and S13 set the hardware and software handshake modes for data communications according to the following:</td></tr>
<tr><td>S12</td><td>S13</td><td>Handshake Mode</td></tr>
<tr><td>0</td><td>0</td><td>No handshake</td></tr>
<tr><td>0</td><td>1</td><td>XON/XOFF (DC1/DC3)</td></tr>
<tr><td>1</td><td>0</td><td>RTS/CTS and DSR/DTR</td></tr>
<tr><td>1</td><td>1</td><td>XON/XOFF and RTS/CTS</td></tr>
<tr><td rowspan="6">S14, S15</td><td rowspan="6">See description.</td><td rowspan="6">Port B Baud Rate.</td><td colspan="3">Sets baud rate for Port B at powerup according to the following:</td></tr>
<tr><td>S14</td><td>S15</td><td>Baud Rate</td></tr>
<tr><td>0</td><td>0</td><td>9600</td></tr>
<tr><td>0</td><td>1</td><td>19200</td></tr>
<tr><td>1</td><td>0</td><td>2400</td></tr>
<tr><td>1</td><td>1</td><td>1200</td></tr>
<tr><td>S16</td><td></td><td>Not used.</td><td colspan="3"></td></tr>
</table>

Proceeding Onward

Now that you've hooked up the data communications cables, you can proceed on to the next chapter for instructions on connecting power to the emulator and an outline of a quick emulator data communications test.

AC Power Connections to the HP 64700

Now that you have selected an emulator system configuration and installed the data communications connections, you can proceed with connecting the emulator to a power source.

This chapter contains information on connecting the emulator to the proper power source. Topics include:

- Verifying that input voltage is correctly set.
- Verifying that you have the correct power cable.
- Connecting the emulator to power and powering up.
- Verifying that the emulator has powered up correctly.
- An overview of how to verify emulator communications with its controller.

Input Voltage and Current Requirements

Your HP 64700-Series Emulator was preset at the factory for either 110 VAC or 220 VAC, depending on your country's prevailing voltage. The input frequency must be in the range of 48-66 Hz. The preset input voltage is shown on the rear panel of the emulator chassis to the upper left of the power connector (see figure 3-1). If you need to change the input voltage requirements, call your local Hewlett-Packard sales and service office (refer to the *HP 64700 Emulators Support Services* guide for the office nearest you).

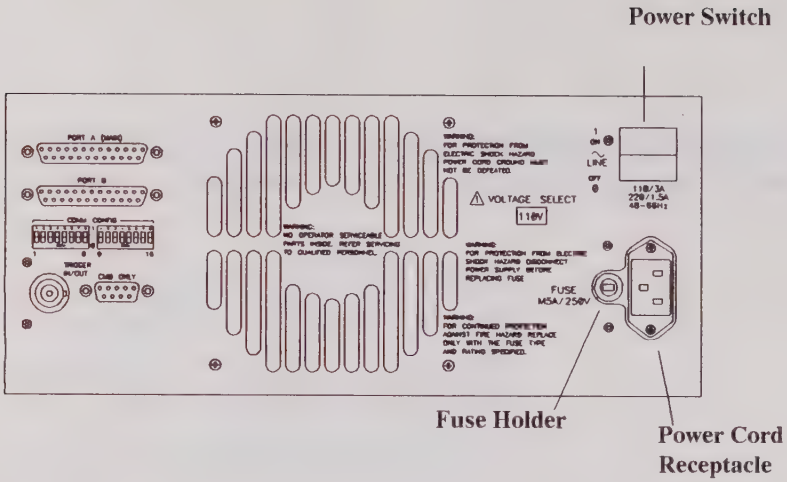


Figure 3-1. Location of Power Input, Switch, and Fuse

Warning

Do not attempt to change the input line voltage selector! Hazardous voltages are present inside the HP 64700 chassis.

Input Current

At 110 VAC, the emulator will draw a maximum of 3.0 A. At 220 VAC, it will draw a maximum of 1.5 A.

Connecting Power and Powerup

Power Cords

Your HP 64700-Series Emulator is shipped from the factory with one power cord appropriate for your country. You should verify

Table 3-1. Power Cord Configurations

PLUG TYPE	CABLE PART NO.	PLUG DESCRIPTION	LENGTH IN/CM	COLOR
OPT 903 125V** 	8120-1378	Straight *NEMA5-15P	90/228	Jade Gray
	8120-1521	90°	90/228	Jade Gray
OPT 900 250 V 	8120-1351	Straight *BS1363A	90/228	Gray
	8120-1703	90°	90/228	Mint Gray
OPT 901 250 V 	8120-1369	Straight *NZSS198/ASC	79/200	Gray
	8120-0696	90°	87/221	Mint Gray
OPT 902 250V 	8120-1689	Straight *CEE7-Y11	79/200	Mint Gray
	8120-1692	90°	79/200	Mint Gray
	8120-2857	Straight (Shielded)	79/200	Coco Brown

* Part number shown for plug is industry identifier for plug only. Number shown for cable is the HP part number for complete cable, including plug.

** These cords are included in the CSA certification approval for the equipment.

Table 3-1. Power Cord Configurations (Cont'd)

PLUG TYPE	CABLE PART NO.	PLUG DESCRIPTION	LENGTH IN/CM	COLOR
OPT 906 250 V	8120-2104 8120-2296	Straight *SEV1011 1959-24507 Type 12 90°	79/20 79/200	Mint Gray Mint Gray
OPT 912 220V	8120-2956 8120-2957	Straight *DHCK107 90°	79/200 79/200	Mint Gray Mint Gray
OPT 917 250V	8120-4600 8120-4211	Straight SABS164 90°	79/200 79/200	Jade Gray Gray
OPT 918 100V	8120-4753 8120-4754	Straight Miti 90°	90/230 90/230	Dark Gray Dark Gray
* Part number shown for plug is industry identifier for plug only. Number shown for cable is the HP part number for complete cable, including plug.				
** These cords are included in the CSA certification approval for the equipment.				

that you have the correct power cable for installation by comparing the power cord you received with the HP 64700 with the drawings under the "Plug Type" column of table 3-1. One end of your cable should match one of the drawings. If it does not, or if the cable you received is not appropriate for your electrical power outlet type, contact your Hewlett-Packard sales and service office.

To connect the power cord, plug the female end (three holes) into the receptacle on the back of the emulator chassis (see figure 3-2) and connect the other end to a power source complying with the preset input voltage of the emulator.

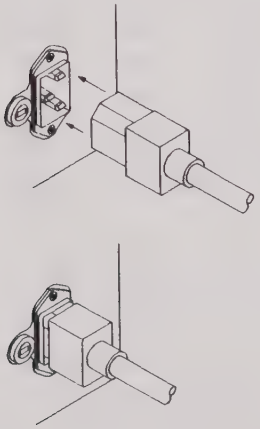


Figure 3-2. Connecting the Power Cord

Line Switch

The line switch is a rocker switch located at the upper right hand corner of the rear panel. To power on the HP 64700-Series Emulator, connect the line cord as described above and switch the rocker to the ON (1) position. To turn power off, switch the rocker to the OFF (0) position.

Powerup Sequence

When you have turned on power to the emulator, you can verify that the emulator has correctly executed its powerup sequence by looking through the air vents on the emulator front panel.

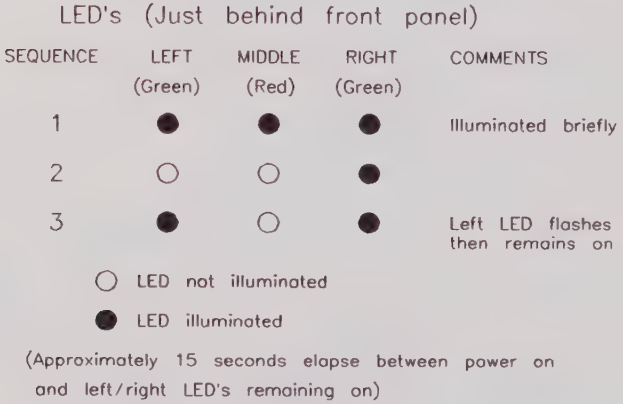


Figure 3-3. LED Sequence at Powerup

Note

If the LEDs do not light in the sequence described above, you may have a loose power connection or an incorrect data communications handshake selection. Recheck your power connections and your handshake configuration (see chapter 2).

If none of the LEDs light and you do not hear the fan running, the emulator line fuse may have failed.

Fuse

A five-ampere, 250 VAC rated fast-acting fuse is used to protect the HP 64700 from severe damage due to incorrect line voltages. It also protects your site power from severe line faults within the emulator. (Both 100-110 VAC and 220-250 VAC applications use the same type and rating fuse.)

If the HP 64700 will not start up when connected to the proper power source and switched on, the fuse may have opened. To replace the fuse, do the following:

1. Place the HP 64700 line switch in the off (0) position.

2. Disconnect the line cord from the power source and from the HP 64700.

3. Insert a medium flat-blade screwdriver in the fuse holder (see figure 3-1) and rotate it counter-clockwise with light pressure until the holder springs out. Remove the fuse holder.

4. Remove the fuse from the fuse holder and replace it with a 5A 250 VAC fast-acting fuse.

5. Reinsert the fuse holder. Insert the screwdriver in the fuse holder and push down, then rotate until the fuse holder locks into place.

6. Reconnect the line cord to the HP 64700 and the power source and power on the HP 64700. If the instrument still does not power up (fan does not rotate, no datacomm initialization, no power on LED at front), refer to the *HP 64700 Support Services* manual.

Verifying Data Communications

When the emulator powers up, it sends a brief message to the selected command port and then displays the Terminal Interface prompt. You can verify that your data communications configuration is at least partially functional by looking for the message and prompt on the controlling device.

For example, if you have an HP Vectra personal computer running HP AdvanceLink, select the proper datacomm port in AdvanceLink (the same one you used to connect to the emulator) and power up the emulator. You should see a message similar to the following (from an HP 64700-Series Emulator for the 68000 microprocessor):

```
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written permission is prohibited, except as allowed under copyright laws.

  HP64700 Series Emulation System
    Version:   A.00.00 20Nov87

  HP64742 Motorola 68000 emulator
  HP64740 Emulation Analyzer
R>
```

The procedure is similar if your emulator is connected to a data terminal. Also, given the proper terminal emulation software, you can verify communications with an HP 9000 Series 300.

You can now run performance verification on the emulator. First, remove the conductive pin protector from the target system probe. Then type the **pv** command, along with the number of times you want to execute the command, as follows:

```
R> pv 2
```

```
   Testing: HP64742 Motorola 68000 emulator
     PASSED
     Number of tests: 1           Number of failures: 0
   Testing: HP64740 Emulation Analyzer
     PASSED
     Number of tests: 1           Number of failures: 0

   Testing: HP64742 Motorola 68000 emulator
     PASSED
     Number of tests: 2           Number of failures: 0
   Testing: HP64740 Emulation Analyzer
     PASSED
     Number of tests: 2           Number of failures: 0

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   HP64700 Series Emulation System
     Version:   A.00.00 20Nov87

   HP64742 Motorola 68000 emulator
   HP64740 Emulation Analyzer
R>
```

If the emulator fails to communicate or fails performance verification:

1. Make sure that you have connected the emulator to the proper power source and that the powerup LEDs have cycled as indicated under the heading "Powerup Sequence."

2. Make sure that you have properly configured the data communications switches on the emulator and the data communications parameters on your controlling device. You should also verify that you are using the correct cable. Refer to chapter 2 of this manual if you have questions.

3. Make sure you have removed the conductive pin protector from the target system probe and that the emulator is not plugged into a target system.

If none of these items seems to solve the problem, call the nearest Hewlett-Packard Sales and Service office listed in the *HP 64700 Support Services manual.*

Use Your Emulator

Now that you have connected data communications and power, you can immediately proceed to using your emulator with the Terminal Interface. You can start with the *Emulator User's Guide* supplied with your emulator.

If you are planning to use your emulator with the PC Interface, you need to install software first, so proceed to the *HP 64000-PC MS-DOS Applications Software Installation manual*, then to the *HP 64700-Series Emulators PC Interface Reference* manual for information on properly configuring the software.

If you are planning to use your emulator with the Softkey Interface, you will also need to install software. Proceed to the *HP-UX Software Installation Notice*, then to the *HP 64700-Series Emulators Softkey Interface Reference* manual for information on configuring the software.

The following chapters give some details about connecting the HP 64700-Series Emulator to your target system and to other instruments for making coordinated measurements.

Connecting to Your Target System

Emulator Probe

Each HP 64700-Series Emulator is shipped with a probe designed to plug into a microprocessor socket appropriate for the microprocessor being emulated. Depending on the emulator you ordered, the probe may adapt to several package types, or it may be suitable for only one type of package.

You will find detailed instructions on connecting the emulator probe to your target system in the *Emulator Terminal Interface User's Guide*.

External Analyzer Probe

If you ordered the optional external analyzer module with your HP 64700-Series Emulator, it will come equipped with a probe (see figure 4-1) allowing you to connect 16 individual target system signals to the external analyzer. This allows you to view target system actions which are not directly related to the microprocessor actions.

Each probe has eight signal wires which have hollow gold-plated ends. You can insert these over the tips of an IC probe clamp designed for that purpose, or you can attach the supplied pin grabbers to connect to individual system pins.

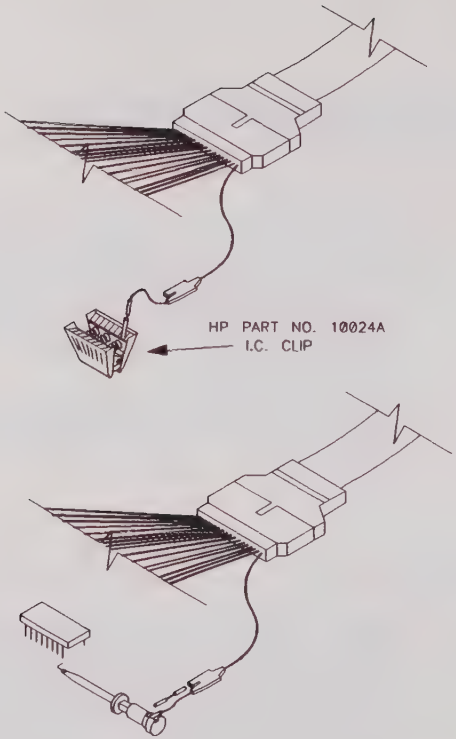

Figure 4-1. Using the Optional External Analyzer Probe

Connecting to Other Instruments

Your HP 64700-Series Emulator includes powerful facilities for communicating with other measuring instruments, including logic analyzers, oscilloscopes, and other HP 64700-Series Emulators. These facilities make it possible to start or stop measurements in one instrument when another instrument reaches a certain state.

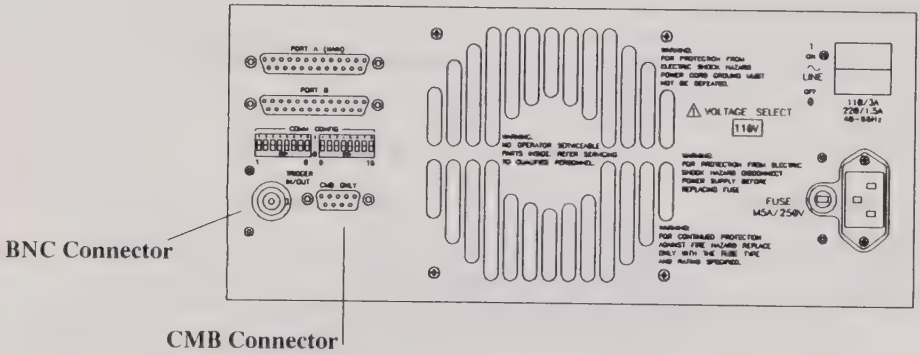

Figure 5-1. Location of CMB and BNC Connectors

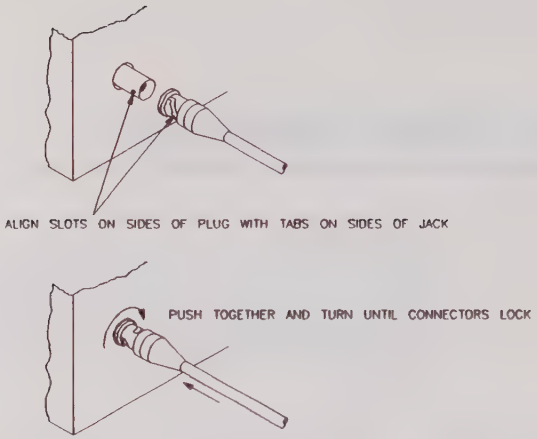

Figure 5-2. Connecting a BNC Cable to the HP 64700

Connecting to the Rear Panel BNC

The rear panel BNC connector allows you to connect various measurement instruments that have a 50 ohm trigger input or output line to the HP 64700-Series Emulator. Thus, you can trigger an HP 64700 measurement from another instrument, or vice versa, depending on the configuration of the two instruments.

To connect the BNC connector to another instrument, simply connect one end of a 50 ohm coaxial cable with male BNC connectors to the HP 64700 BNC receptacle, and the other end to the appropriate BNC receptacle on the other measuring instrument.

Caution

POSSIBLE DAMAGE TO EMULATOR!

The BNC line on the HP 64700 accepts input and output of TTL levels only. (TTL levels should not be less than 0 volts or greater than 5 volts.) Failure to observe these specifications may result in damage to the HP 64700-Series Emulator.

Connecting the Coordinated Measurement Bus (CMB)

The Coordinated Measurement Bus (CMB) allows you to connect multiple HP 64700-Series Emulators together to participate in a measurement. Using the commands provided by the controlling software interfaces, you can set up the multiple emulators to begin emulation runs synchronously, have one emulation analyzer begin a measurement when another finds a certain state, and so on. Refer to the *CMB User's Guide* for instructions on making coordinated measurements using the CMB.

To use the CMB, you will need one CMB cable for the first two emulators and one additional CMB cable for every emulator after the first two. The CMB cable is orderable from HP under product number 64023A. The cable is four meters long.

To connect two emulators together using the CMB cable, see figure 5-3.

To connect more than two emulators together using multiple CMB cables, you use the female connector spaced a short distance from one end of the CMB cable. This allows you to daisy chain emulators up to the limits of maximum CMB cable length. Refer to the *CMB User's Guide* for cabling restrictions and configuration information.

Caution

POSSIBLE DAMAGE TO EMULATOR!

Be careful to not confuse the 9-pin connector used for CMB operations with those used by some computer systems for RS-232C communications. Applying RS-232C signals to the CMB connector is likely to result in damage to the HP 64700-Series Emulator.

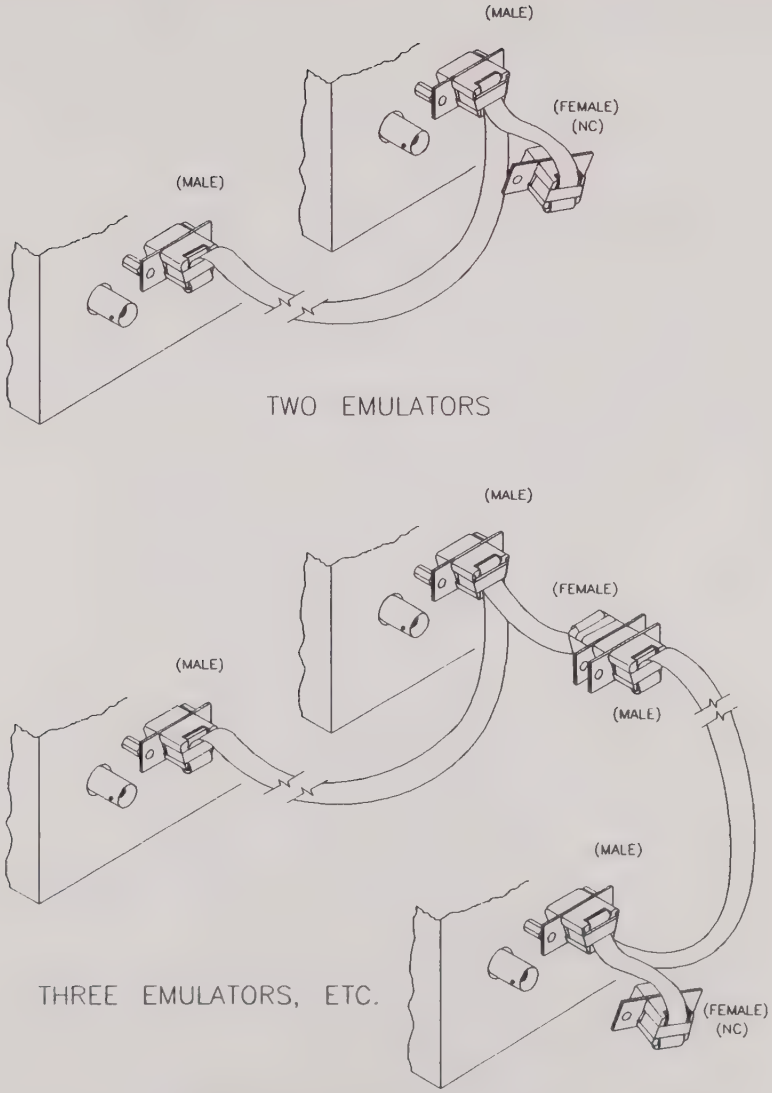

Figure 5-3. Connecting the CMB Cable

Notes

Installing Emulator Handles

Your HP 64700-Series Emulator comes with a pair of handles which you can attach to the emulator to provide you with additional convenience in carrying the emulator or in positioning it with relation to your target system.

Figure 6-1 shows you how to attach the handles. You will need a Torx T10 driver to install the handles. (You may unplug the rubber feet attached to the bottom of the emulator to gain access to the corner holes for attaching the handles. Be sure to save these, as you may wish to re-use them later. The feet will fit into any of the holes on the bottom case.)

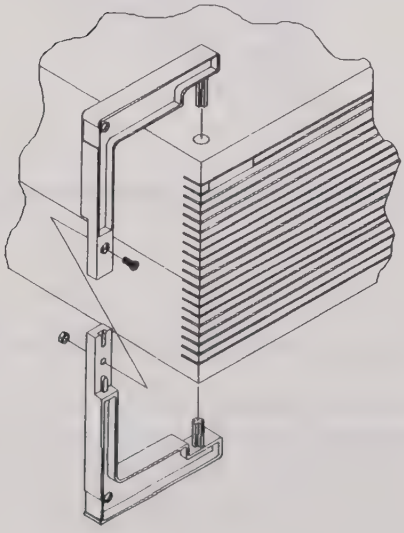

Figure 6-1. Installing Emulator Handles

Figure 6-2 shows both handles attached to one side of the emulator chassis. This would be useful for standing the emulator on its side or for suspending the emulator from overhead hooks.

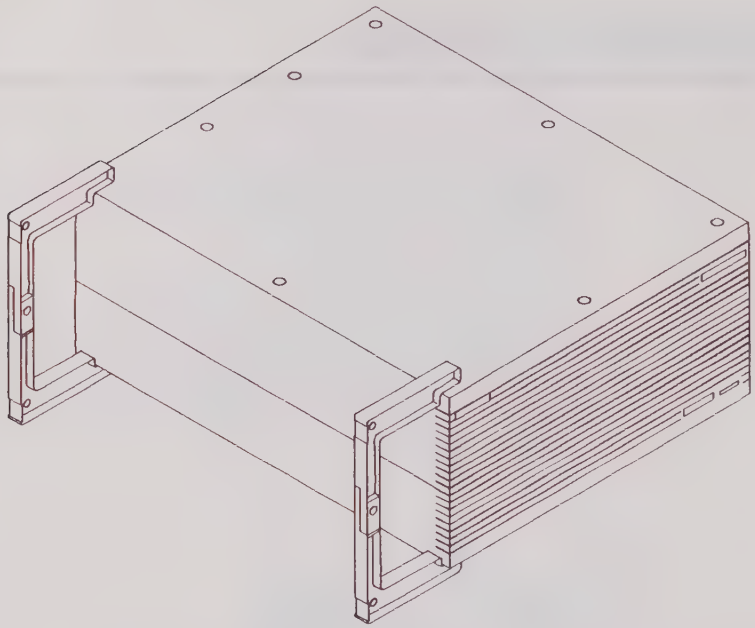

Figure 6-2. Both Handles on One Side of the Emulator

Caution

POSSIBLE DAMAGE TO EMULATOR!

Any components that you use to suspend the emulator must be rated for a 65 lb. capacity. Damage to the emulator will occur if your suspension components fail to support the emulator.

Figure 6-3 shows both handles attached to one end of the emulator. This can be useful if you often transport the emulator from one location to another.

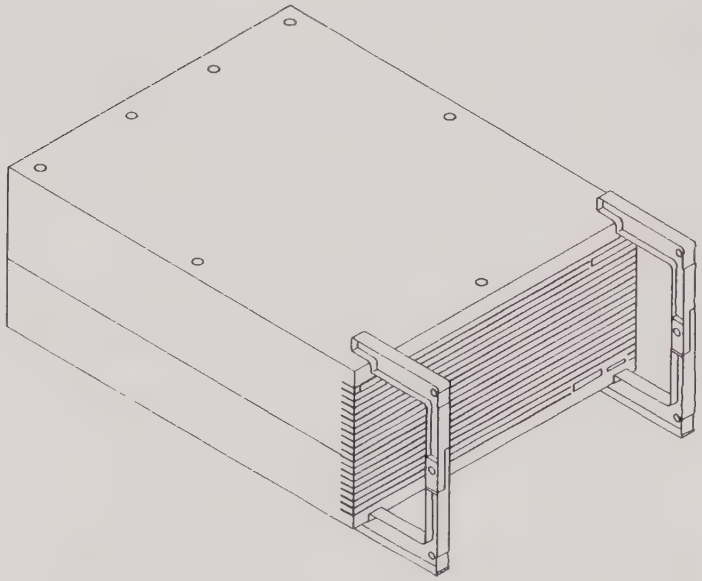

Figure 6-3. Both Handles at the Emulator Front

Caution

POSSIBLE DAMAGE TO EMULATOR!

Regardless of how you position the emulator, make sure that there is no strain placed on the target system probe cable. (For example, suspending the emulator's weight by the target system cable would cause excessive strain.) Such a strain can cause breaks in the cable wiring which may manifest as intermittent or continuous failures.

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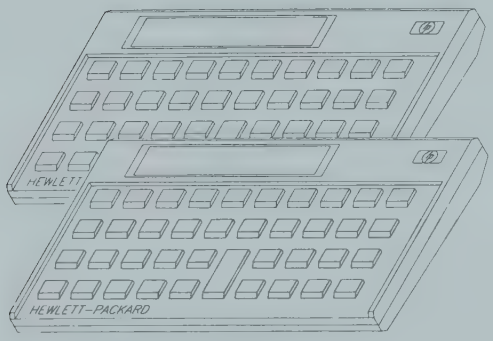

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HP 64700 Emulators: Glossary Of Terms

Edition1

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Glossary Of Terms

A

Absolute File - a file consisting of machine-readable instructions in which absolute addresses are used to store instructions, data, or both. These are the files that are generated by the compiler/assembler/linker and are loaded into HP 64700 Series emulators.

Analyzer - an instrument that captures activity of signals synchronously with a clock signal. An emulation analyzer captures emulator bus cycle information. An external analyzer captures activity on signals external to the emulator.

Arm Condition - a condition that reflects the state of a signal external to the analyzer. The arm condition can be used in branch or storage qualifiers. External signals can be from another analyzer or an instrument connected to the CMB or BNC.

Assembler - a program that translates symbolic instructions into object code.

B

Background - a memory that parallels the emulation processor's normal address range. Entry to background can only take place under system control, and cannot be reached via a user's program.

Background Monitor - a monitor program which operates entirely in the background emulator mode. The background monitor executes when user program execution is temporarily suspended. The background monitor does not occupy processor address space.

BNC Connector - a connector that provides a means for the emulator to drive/receive a trigger signal to/from an external device (such as a logic analyzer, oscilloscope, or HP 64000-UX system).

Breakpoint - a point at which emulator execution breaks from the user program and begins executing in the monitor. (See also Software Breakpoint.)

C

Command File - a file containing a sequence of commands to be executed.

Compiler - a program that translates high-level language source code into object code, or produces an assembly language program with subsequent translation into object code by an assembler. Compilers typically generate a program listing which may list errors displayed during the translation process.

Configuration File - a file in which configuration information is stored. Typically, configuration files can be modified and reloaded to configure instruments (such as an emulator) or programs (such as the PC Interface).

Coordinated Measurement - a synchronized measurement made between the emulator and analyzer, between emulation analyzer and external analyzer, or between multiple emulators or analyzers. For example, a coordinated measurement is made when two or more HP 64700 emulators/analyzers start executing together, or break into background at the same time.

Coordinated Measurement Bus (CMB) - the bus that is used for communication between multiple HP 64700 Series emulators/analyzers or between HP 64700 emulators/analyzers and an HP 64306 IMB/CMB Interface to allow coordinated measurements.

Coverage Analysis - a measure of the percentage of memory accessed by a user program. For each byte of HP 64700 emulation memory there is an additional bit of memory set when that byte is accessed (written to or read from). You can use the coverage command to view the memory locations that have been accessed.

Cross-Trigger - the situation in which the trigger condition of one analyzer is used to trigger another analyzer. Two signals internal to the HP 64700 allow cross-triggering between emulation and external analyzers.

D

DCE (Data Communications Equipment) - a specific RS-232C hardware interface configuration. Typically, DCE is a modem.

Downloading - the process of transferring absolute files from a host computer into the emulator.

DTE (Data Terminal Equipment) - a specific RS-232C hardware interface configuration. Typically, DTE is a terminal or printer.

E

Emulation Analyzer - a system component built into the HP 64700 that captures the emulation processor's address, data, and status information.

Emulation Memory - high-speed memory (RAM) in the emulator which can be used in place of target system memory. Emulation memory is implemented in such a way that commands which access this memory do not cause breaks in program execution.

Emulator - a tool that replaces the processor in your target system. The goal of the emulator is to operate just like the processor it replaces. The emulator gives information about the bus cycle operation of the processor and control over target system execution. Using the emulator, you may view contents of processor registers, target system memory, and I/O resources.

Emulator Probe - the cable which connects the emulator to the target system microprocessor socket.

Escape Sequence (transparent mode) - a keyboard input consisting of a special sequence of characters, beginning with the escape character (1C hexadecimal). This sequence is used to access an emulator while in transparent mode. When using multiple emulators and transparent mode to access the different emulators, each one must be given a unique escape character.

External Analyzer - a component built into the HP 64700 that captures activity on signals external to the emulator.

External Analyzer Probe - a set of 16 lines that connect the external analyzer to target system signals.

F

Foreground - the directly addressable memory range of the emulation processor.

Foreground Monitor - a monitor program that executes in the foreground emulator mode. When the monitor exists in foreground, it is directly accessible by, and can interact with, the user's program.

Fork - temporary diversion from one program or process to start another program or process.

Form - the part of the PC Interface screen that allows you to enter data for modifying various parameters.

G

Guarded Memory - an address range that is to be inaccessible to the emulation processor. The emulator will generate a break and display an error message if an access to guarded memory occurs.

H

Handshaking - a process that involves receiving and/or sending control characters which indicate a device is ready to receive data, that data has been sent, and that data has been accepted.

Host Computer - a computer to which an HP 64700 Series emulator can be connected. A host computer may run interface programs which control the emulator. Host computers may also be used to develop programs to be downloaded into the emulator.

Hybrid Foreground/Background Monitors - refers to an emulation design that allows the use of background and foreground monitor programs.

I

InterModule Bus (IMB) - the bus connecting two or more HP 64000-UX emulators/analyzers or an HP 64000-UX emulator/analyzer and an HP 64306 IMB/CMB Interface to allow coordinated measurements.

Inverse Assembler - a program that translates absolute code into assembly language mnemonics.

L

Linker - a program that combines relocatable object modules into an absolute file which can be loaded into the emulator and executed.

Locked Exit - one of two methods used leave the PC Interface and return to host computer operating system. A locked exit command allows you to exit the PC Interface and re-enter later with the current configuration. (See also Unlocked Exit.)

Logging Commands - the process of automatically storing entered commands into a file. This file can later be used as a command file.

Logical Address Space - the amount of virtual memory that a microprocessor is capable of accessing. Virtual memory techniques (for example, using pages or segments to address memory consisting of a limited amount of high-speed physical memory and a large capacity memory device such as a disc) can allow processors to access more memory than permitted by the size of the address bus.

M

Macros - custom made commands that represent a sequence of other commands. Entire sequences of commands defined in macros will be automatically executed when you enter the macro name. Macro nesting is permitted; this allows a macro definition to contain other macros.

Memory Mapper Term - a number assigned to a specific address range in the memory map. Term numbers are consecutive.

Memory Mapping - defining ranges of the processor address space as emulation RAM or ROM, target RAM or ROM, or guarded memory.

Monitor Program - a program executed by the emulation processor that allows the emulation system controller to access target system resources. For example, when you enter a command that requires access to target system resources, the system controller writes a command code to a storage area and breaks the execution of the emulation processor from the user program into the monitor. The monitor program then reads the command from the storage area and executes the processor instructions that access the target system. After the target system resources have been accessed, execution returns to the user program.

O

Operating System - software which controls the execution of computer programs and the flow of data to and from peripheral devices.

P

Parity Setting - the configuration of the parity switches. Depending on the configuration of the parity output switch and the parity switch, a parity check bit is added to the end of data to make the sum of the total bits is even or odd. A parity check is performed after data has been transferred, and is accomplished by testing a unit of the data for either odd or even parity to determine whether an error has occurred in reading, writing, or transmitting the data.

Path - also referred to as a directory (for example \users\projects).

Pass Through Mode - see Transparent Mode.

PC Interface - a program that runs on the HP Vectra and IMB PC/AT compatible computers. This is a friendly interface used to operate an HP 64700 Series emulator.

Performance Verification - a program that tests the emulator to determine whether the emulation and analysis hardware is functioning properly.

Physical Address Space - the amount of real address space that a microprocessor is capable of addressing. A processor's physical address space can be determined by the number of address lines (for example, a microprocessor with 16 address lines has an address space of 2^{16}, or 64K memory locations.

Prefetch - the ability of a microprocessor to fetch additional opcodes and operands before the current instruction is finished executing.

Prestore - the storage of analyzer states that precede states which are normally stored. If the normal storage qualifier specifies the entry address of a function or routine, prestore can be used to identify callers of that function or routine.

R

Real-Time Execution - refers to the emulator configuration in which commands that temporarily interrupt user program execution (for example, display/modify target memory or processor registers) are not allowed.

Remote Configuration - the configuration in which an HP 64700 series emulator is directly connected to a host computer via a single port. Commands are entered (typically from an interface program running on the host computer) and absolute code is downloaded into the emulator through that single port.

RS-232C - a standard serial interface used to connect computers and peripherals.

S

Sequencer - an analyzer state machine that searches for execution of states in a particular sequence.

Single-step - the execution of one microprocessor instruction. Single-stepping the emulator allows you to view program execution one instruction at a time.

Softkey Interface - the host computer interface program used in the HP 64000-UX environment. The Softkey Interface is a friendly interface used to control HP 64700 emulators.

Software Breakpoint - an address at which a particular opcode causes program execution to break into the monitor. The designated software breakpoint instruction varies among

emulators. Software breakpoints are used to stop user program execution at a particular point so that you can view the state of the processor or target system.

Standalone Configuration - the configuration in which a data terminal is used to control the HP 64700 Series emulator, and the emulator is not connected to a host computer.

stderr - an abbreviation for "standard error output". Standard error can be directed to various output devices connected to the HP 64700 ports.

stdin - an abbreviation for "standard input". Standard input is typically defined as your computer keyboard.

stdout - an abbreviation for "standard output". Standard output can be directed to vaarious output devices connected to the HP 64700 ports.

Step - See Single-step.

Synchronous Execution - the execution of multiple HP 64700 Series emulator/analyzers at the same time (i.e., multiple emulator start/stop).

Syntax - the way in which expressions are structured in command languages. Syntax rules determine which forms of command language syntax are grammatically acceptable.

T

Target System - the circuitry where the emulator probe is plugged into (typically a microprocessor system under development).

Target System Memory - storage that is present in the target system.

Terminal Interface - the command interface present inside the HP 64700 Series emulators that is used when the emulator is connected to a simple data terminal. This interface provides on-line help, command recall, macros, and other features which provide for easy command entry from a terminal.

Trace - a collection of states captured synchronously by the analyzer.

Transparent Configuration - the configuration in which the HP 64700 emulator is connected between a data terminal and a host computer. When the emulator is in the transparent (pass through) mode, the data terminal acts like a normal terminal connected to the computer. In this configuration, you can develop code on the host computer and download absolute code into the emulator for debugging and testing.

Transparent Mode - the emulator mode in which all characters received on one port will be copied to the other port. This mode allows a data terminal (connected to one emulator port) to access a host computer (connected to the other emulator port) through the emulator.

Trigger - the condition that specifies when an analyzer trace measurement is to be taken. Trigger also refers to the analyzer signal that becomes active when the trigger condition is found.

U

Uploading - the transfer of emulation or target system memory contents to a host computer.

Unlocked Exit - one of two methods used leave the PC Interface and return to host computer operating system. An unlocked exit command allows you to exit the PC Interface and re-enter later with the default configuration. (See also Locked Exit.)

V

Viewport - see Window.

W

Wait States - extra microprocessor clock cycles which increase the total time of a bus cycle. Wait states are typically used when slower memory is implemented.

Window - a specified rectangular area of virtual space shown on the display in which data can be observed.

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Logic Systems Division
8245 North Union Boulevard
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A software code may be printed before the date; this indicates the version level of the software product at the time the manual was issued. Many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one to one correspondence between product updates and manual revisions.

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Support For Your HP Products

What Is This Document About?

This document supplies you with information about Hewlett-Packard's support services for HP 64000 Series products.

Hewlett-Packard's support services help you obtain greater performance from your HP products and keep you current on HP software, hardware, and documentation. Read on to learn more about our support services.

Support Services

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13763 Les Milles Cedex
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Telex 410 844 hpbhg

Hewlett-Packard GmbH
Geschäftsstelle
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D-1000 **BERLIN** 30
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Telex: 018 3405 hpbln d

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5300 **BONN**
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Telex 8869421

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Zeneralbereich Mktg
Herrenberger Strasse 130
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Postfach 1251
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GREECE

Hewlett-Packard Hellas
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GUATEMALA

IPESA DE GUATEMALA
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France
Tel: (1) 45 31 09 06
Telex: 203376
Fax: (1) 45 31 09 18

HONG KONG

Hewlett-Packard Asia, Ltd.
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HONG KONG
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Tel: (81/3) 458-5411

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29-21 Takaido-Higashi, 3-chome
Suginami-ku **TOKYO** 168
Tel: (03) 331-6111
Telex: 232-2024 YHPTOK

Yokogawa Hokushin Electric Corp.
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Shinjuku-NS Bldg. 10F
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Yokogawa-Hewlett-Packard Ltd.
Toyoda-Tokyo-Kaijo Bldg.
1-179 Miyuki-Hon-Cho
TOYODA 473
Tel: (81/565) 27-5611

Yokogawa-Hewlett-Packard Ltd.
Chiyodaseimei-Utsunomiya Bldg.
2-3-1, Ohdori, **UTSUNOMIYA,** Tochigi-
Shi 320
Tel: (81/286) 33-1153
Fax: (81/286) 33-1175

Yokogawa-Hewlett-Packard Ltd.
No. 2 Yasuda Bldg.
2-32-12, Tsuruyo-cho
Kanagawa-ku, **YOKOHAMA** 221
Tel: (81/45) 312-1252
Fax: (81/45) 311-8328

KENYA

ADCOM Ltd., Inc., Kenya
P.O. Box 30070
NAIROBI
Tel: 331955
Telex: 22639

KOREA

Samsung Hewlett-Packard Co. Ltd.
Dongbang Yeoeuido Building
36-1 Yeoeui Do-Dong
Youngdeungpo-Ku
SEOUL, 150
Tel: (82/2) 784-4666, 784-2666
Fax: (82/2) 784-7084
Telex: 25166 SAMSAN K

KUWAIT

Al-Khaldiya Trading & Contracting
P.O. Box 830
SAFAT 13009
Tel: 242 49 10, 241 17 26
Telex: 22481 AREEG KT
Cable: VISCOUNT

LEBANON

Computer Information Systems S.A.L.
Chammas Building
P.O. Box 11-6274
DORA BEIRUT
Tel: 89 31 13, 58 18 35
Telex: 42309 chacis le
Fax: 58 18 34

LUXEMBOURG

Hewlett-Packard Belgium S.A./N.V.
Blvd de la Woluwe, 100
Woluwedal
B-1200 **BRUSSELS**
Tel: (32/2) 761-3111
Telex: 23-494 paloben bru

MADAGASCAR

R.T.I.
175, Rue Blomet
75015 Paris
FRANCE
Tel: (1) 45 31 09 06
Tlx: 203376
Fax: (1) 45 31 09 18

MALAWI

Systron (Private) Ltd.
Manhattan Court
61 Second Street
P.O. Box 3458
HARARE
Zimbabwe
Tel: 739881/739885
Telex: 4122
Fax: 70 20 08

MALAYSIA

Hewlett-Packard Sales (Malaysia)
Sdn. Bhd.
9th Floor
Chung Khiaw Bank Building
46, Jalan Raja Laut
50350 **KUALA LUMPUR, MALAYSIA**
Tel: (60/3) 298-6555
Fax: (60/3) 291-5495

Protel Engineering
P.O.Box 1917
Lot 6624, Section 64
23/4 Pending Road
Kuching, **SARAWAK**
Tel: 36299
Telex: 70904 PROMAL MA
Cable: PROTELENG

MALTA

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: (1) 45 31 09 06
Telex: 203376
Fax: (1) 45 31 09 18

MAURITANIA

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: (1) 45 31 09 06
Tlx: 203376
Fax: (1) 45 31 09 18

MAURITIUS

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: (1) 45 31 09 06
Telex: 203376
Fax: (1) 45 31 09 18

MEXICO

Hewlett-Packard de Mexico,
S.A. de C.V.
Rio Nio No. 4049 Desp. 12
Fracc. Cordoba
JUAREZ, Mexico
Tel: 161-3-15-62

Hewlett-Packard de Mexico,
S.A. de C.V.
Condominio Kadereyta
Circuito del Mezon No. 186 Desp. 6
Col. Del Prado - 76030
QRO, Mexico
Tel: 463-6-02-71

Hewlett-Packard de Mexico,
S.A. de C.V.
Monti Morelos No. 299
Fraccionamiento Loma Bonita 45060
GUADALAJARA, Jalisco
Tel: (52/36) 31 46 00
Telex: 0684 186 ECOME

Hewlett-Packard de Mexico,
S.A. de C.V.
Monte Pelvoux No. 111
Lomas de Chapultepec
11000 **MEXICO, D.F.**
Tel: (52/5) 596 79 33
Fax: (52/5) 596 42 08 (Ext 3231)

Hewlett-Packard de Mexico,
S.A. de C.V.
Czda. del Valle
409 Ote. 4th Piso
Colonia del Valle
Municipio de Garcia
66220 **NUEVO LEON**
Tel: 83-78-42-40
Telex: 382410 HPMY

Hewlett-Packard Co.
Latin America Region
Customer Support Center
7208 N.W. 31st St.
MIAMI, FL 33122
United States
Tel: (305) 599-0465
Telex: 441603 HPMIAMI
Fax: 599-0277

Hewlett-Packard de Mexico,
S.A. de C.V.
Blvd. Independencia No. 2000 Ote.
Ote Zerpiso
Co 1 Estrella
27010 **TORREON, COA.**
Tel: (52/171) 8 22 01

MOROCCO

Sicotel
Complexe des Habous
Tour C, avenue des Far
CASABLANCA 01
Tel: 31 22 70
Telex: 27604

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: (1) 45 31 09 06
Tlx: 203376
Fax: (1) 45 31 09 18

Socofren Maroc
164, Boulevard D' Anfa
CASABLANCA
Tel: 36 08 84, 36 01 77
Telex: 23940

NETHERLANDS

Hewlett-Packard Nederland
Startbaan 16
1187 XR **AMSTELVEEN**
Tel: (31/20) 5476911
Telex: 13 216 HEPA NL
Fax: (31/20) 471825

Hewlett-Packard Nederland B.V.
Bongerd 2
NL 2900AA **CAPELLE A/D IJSSEL**
Tel: 31-20-51-6444
Telex: 21261 HEPAC NL

Hewlett-Packard Nederland B.V.
Pastoor Petersstraat 134-136
P O Box 2342
NL 5600 CH **EINDHOVEH**
Tel: 31-40-32-6911
Telex: 51484 hepae nl
Fax: (31/40) 446546

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
5 Owens Road
P.O. Box 26-189
Epsom, **AUCKLAND**
Tel: (64/9) 605-651
Fax: (64/9) 600-507

Hewlett-Packard (N.Z.) Ltd.
186-190 Willis Street
P O Box 9443
WELLINGTON
Tel: (64/4) 820-400
Fax: (64/4) 843-380

NIGER

S.I.T.E.L
Immeuble le General
Avenue General de Gaulle
PO Box 161
ABIDJAN 01
Ivory Coast
Tel: 32 12 27
Telex: 22149

NIGERIA

Management Information Systems Ltd.
3 Gerrard Road, Ikoyi
LAGOS
Tel: 68 08 87
Telex: 23582
Fax: 68 54 87

NORTHERN IRELAND

See United Kingdom

NORWAY

Hewlett-Packard Norway A/S
Oesterndalen 16-18
P.O. Box 34
N-1345 **OESTERAAS**
Tel: (47/2) 24-6090
Telex: 76621 HPNAS N

Hewlett-Packard Norway A/S
Boemergt 42
Box 2470
N-5037 **SOLHEIMSVIK**
Tel: (5/29) 10 72

OMAN

Suhail & Saud Bahwan
P.O.Box 169
MUSCAT/SULTANATE OF OMAN
Tel: 79 37 41
Telex: 3585 mb
Fax: 79 61 58

Imtac LLC
P O Box 9196
MINA AL FAHAL/SULTANATE OF OMAN
Tel: 70-77-27, 70-77-23
Telex: 3865 Tawoos On

PAKISTAN

Mushko & Company Ltd.
House No. 16, Street No 16
Sector F-6/3
ISLAMABAD
Tel: 824545
Telex: 54001 Muski Pk
Cable: FEMUS Islamabad

Mushko & Company Ltd.
Oosman Chambers
Abdullah Haroon Road
KARACHI 0302
Tel: 524131, 524132
Telex: 2894 MUSKO PK
Cable: COOPERATOR Karachi

PANAMA

Electronico Balboa, S.A.
Calle Samuel Lewis, Ed. Alfa
Apartado 4929
PANAMA CITY
Tel: 9-011-507-636613
Telex: 368 3483 ELECTRON PG

PERU

Cia Electro Médica S.A. (ERMED)
Los Flamencos 145, Ofc. 301/2
San Isidro
Casilla 1030
LIMA 1 Peru
Tel: 9-011-511-4-414325, 41-3705
Telex: 39425257 PE PB SIS

PHILIPPINES

The Online Advanced Systems Corp.
2nd Floor, Electra House
115-117 Esteban Street
P.O. Box 1510
Legaspi Village, Makati
Metro **MANILA**
Tel: 815-38-10 (up to 16)
Telex: 63274 ONLINE PN

PORTUGAL

Mundinter Intercambio
Mundial de Commercio
Avenida Antonio 2761
LISBON
Tel: 53 21 31, 53 21 37
Telex: 16691

CPC Instrumentacao
Torre de Santo Antonio
rue Gregorio Lopes, Lote
Restelo
1400 **LISBON**
Tel. 617343/44/45/46
Telex: 27432/26054
Fax: 617345

C.P.C.S.I.
Rua de Costa Cabral 575
4200 **PORTO**
Tel: 493122
Telex: 26054, 27432
Fax: 48 87 21

PUERTO RICO

Hewlett-Packard Puerto Rico
Box 4046
Aguadilla, PR 00605
Tel: (809) 891-5235

Hewlett-Packard Puerto Rico
101 Munoz Rivera Avenue
Esu. Calle Ochoa
HATO REY, 00918
Tel: (809) 754-7800

QATAR

Qatar Datamation Systems
P.O. Box 350
DOHA
Tel: 41 32 82
Tlx: 4833
Fax: 42 63 78

REUNION ISLAND

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: (33/1) 45310906
Telex: 42/203376

RWANDA

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: (33/1) 45310906
Telex: 42/203376
Fax: (1) 45 31 09 18

SAUDI ARABIA

Modern Electronics Establishment
P.O. Box 281
Thuobah
AL-KHOBAR 31952
Tel: 895-1760, 895-1764
Telex: 671 106 HPMEEK SJ
Cable: ELECTA AL-KHOBAR

Modern Electronics Establishment
P.O. Box 1228
Redec Plaza, 6th Floor
JEDDAH
Tel: 644 96 28
Telex: 4027 12 FARNAS SJ
Cable: ELECTA JEDDAH

Modern Electronics Establishment
P.O.Box 22015
RIYADH 11495
Tel: 4763030
Telex: 402040 MEERYD SJ

SCOTLAND

See United Kingdom

SENEGAL

2SC
10, rue Tolbiac
B.P. 3716
DAKAR R.P.
(Please contact R.T.I. France.)
Tel: (221) 222248
Telex: 906/671

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: 45310906
Telex: 203376
Fax: (1) 45.31.09.18

SINGAPORE

Hewlett-Packard Singapore Ltd.
1150 Depot Road
SINGAPORE, 0410
Tel: (65) 273 7388
Fax: (65) 278 8990

SOUTH AFRICA

Hi Performance Systems (Pty.) Ltd.
P.O. Box 120, Howard Place
CAPE TOWN 7450
Tel: (27/21) 53-7954
Fax: (27/21) 53-5119

Hi Performance Systems (Pty.) Ltd.
Private Bag Wendywood
SANDTON 2144
Tel: (27/11) 802-5111
Fax: (27/11) 802-6332

SPAIN

Hewlett-Packard Española, S.A.
Avda. Diagonal, 605
08028-**BARCELONA**
Tel: (34/3) 401 91 00
Telex: 52603 hpbee

Bilbao (Vizcaya) Sales
Hewlett-Packard Español, S.A.
Avda. Zugazarte, 8
48930 - Las Arenas - **VIZCAYA**

Hewlett-Packard Española, S.A.
Crta. N-VI, Km. 16, 500
Las Rozas
E-MADRID
Tel: (34/1) 6370011
Telex: 23515 HPE

Hewlett-Packard Española, S.A.
Avda. S. Francisco Javier, S/N
Planta 10. Edificio Sevilla 2
E-SEVILLA 5, SPAIN
Tel: (34/54/64) 4454
Telex: 72933

Hewlett-Packard Española, S.A.
Isabel La Catolica, 8
46004 **VALENCIA**
Tel: (34/6) 351 59 44
Telex: 63435
Fax: (34/6) 351 59 44

Hewlett-Packard Española, S.A.
Avda. de Zugazarte, 8
48930 - Las Arenas
VIZCAYA
Tel: (34/4) 464 32 55
Telex: 33032

SUDAN

Mediterranean Engineering &
Trading Co., Ltd
P.O. Box 1025
KHARTOUM
Tel: (249) 41184
Telex: 24052

R.T.I.
175, Rue Blomet
75015 **PARIS**
France
Tel: (1) 45.31.09.06
Tlx: 203376
Fax: (1) 45.31.09.18

SWEDEN

Hewlett-Packard Sverige AB
Östra Tullgatan 3
20011 **MALMÖ**
Box 6132
Tel: (46/40) 702 70
Telex: (854) 17886 (via Spånga office)
Fax: (46/40) 97 74 18

Hewlett-Packard Sverige AB
Elementvagen 16
S-7022 7 **OREBRO**
Tel: (49/19) 10 48 80
Telex: (854) 17886 (via Spånga office)

Hewlett-Packard Sverige AB
Skalholtsgatan 9, Kista
P.O. Box 19
S-16493 **KISTA**
Tel: 46/8/750-200
Telex: (854) 17886
Telefax: (08) 7527781

Hewlett-Packard Sverige AB
Box 266
Topasgatan 1A
S-42123 **VÄSTRA-FRÖLUNDA**
(Gothenburg)
Tel: (031) 891000
Telex: (854) 17886 (via Spånga office)

SWITZERLAND

Hewlett-Packard (Schweiz) AG
Clarastrasse 12
CH-4058 **BASEL**
Tel: (41/61) 681 59 20
Fax: (41/61) 681 98 59

Hewlett-Packard (Schweiz) AG
7, rue du Bois-du-Lan
Case postale 365-1366
CH-1217 **MEYRIN** 1
Tel: (41/22) 7804111
Telex:27333 HPAG CH

Hewlett-Packard (Schweiz) AG
Allmend
CH-8967 **WIDEN**
Tel: (41/57) 321 111
Telex: 53933 HPAG CH
Fax: (41/57) 321 475

SYRIA

Middle East Electronics
P O Box 2308
Abu Rumaneh
DAMASCUS
Tel: 33 45 92
Telex: 411 771 Meesy

TAIWAN

Hewlett-Packard Taiwan Ltd
Taipei Office
8th Floor, Hewlett-Packard Building
337 Fu Hsing North Road
TAIPEI
Tel: (02) 712-0404
Telex: 24439 HEWPACK
Cable: HEWPACK Taipei

Hewlett-Packard Taiwan Ltd
THM Office
2, Huan Nan Road
CHUNG LI, Taoyuan
Tel: (034) 929-666

TAIWAN (Cont'd)

Hewlett-Packard Taiwan Ltd.
Taichung Office
5FL, 67, Sec. 3,
Wen-Hsin Road,
TAICHUNG
Tel: (04) 254-1201

Hewlett-Packard Taiwan Ltd.
Kaohsiung Office
11/F, 456, Chung Hsiao 1st Road
KAOHSIUNG
Tel: (07) 2412318

TANZANIA

Adcom Ltd, Inc. Kenya
P.O. Box 30070
NAIROBI
Kenya
Tel: 33 19 55
Telex: 22639

THAILAND

Unimesa Co. Ltd.
2540 Sukumwit Avenue
Bangna
BANGKOK 10260
Tel: 662-398-6953
Telex: 84439 Simonco TH
Cable: UNIMESA Bangkok

TOGO

S.I.T.E.L.
Immeuble le General
Avenue General de Gaulle
P.O. Box 161
ABIDJAN 01
Ivory Coast
Tel: 32 12 27
Telex: 22149

Societe Africaine De Promotion
Immeuble Sageb
Rue d'Atakpame
P.O. Box 4150
LOME
Tel: 21-62-88
Telex: 5357

TRINIDAD & TOBAGO

Caribbean Telecoms Ltd.
Corner McAllister Street &
Eastern Main Road, Laventille
P.O. Box 732
PORT-OF-SPAIN
Tel: 624-4213
Telex: 22561 CARTEL WG
Cable: CARTEL, PORT OF SPAIN

Computer and Controls Ltd.
P.O. Box 51
1 Taylor Street
PORT-OF-SPAIN
Tel: (809) 622-7719/622-7985
Telex: 38722798 COMCON WG
LOOGO AGENCY 1264

TUNISIA

Precision Electronique
5, rue de Chypre
Mutuelleville
1002 **TUNIS BELVEDERE**
Tunisia
Tel: 78 50 37
Tlx: 13238

TURKEY

E.M.A.
Mediha Eldem Sokak No. 41/6
Yenisehir
ANKARA
Tel: 131 4695, 131 9175
Telex: 46912n emsetr
Cable: EMATRADE ANKARA

Hewlett-Packard Bilgisayar Ve Olcum
Sistemleri A.S. (Headquarter)
Mesrutiyet Mah. 19 Mayis Cad.
Nova-Baran Plaza Kat: 11-12
SISLI / ISTANBUL
Tel: 175 29 70
Telex: 39150
Fax: 175 29 92

Hewlett-Packard Bilgisayar Ve Olcum
Sistemleri A.S.
Paris Caddesi No 3
Diare 9
06670 **ANKARA**
Tel: 125 83 13
Telex: 46180
Fax: 125 47 45

UGANDA

Adcom Ltd, Inc. Kenya
P O Box 30070
NAIROBI
Kenya
Tel: 33 19 55
Telex: 22639

UNITED ARAB EMIRATES

Emitac Ltd.
P.O. Box 1641
SHARJAH
Tel: 591181
Telex: 48710 EMITAC EM
Cable: EMITAC SHARJAH

Emitac Ltd.
P.O. Box 2711
ABU DHABI
Tel: 820419-20
Cable: EMITACH ABUDHABI

Emitac Ltd.
P.O. Box 8391
DUBAI,
Tel: 377591

Emitac Ltd.
P.O. Box 473
RAS AL KHAIMAH
Tel: 28133, 21270

UNITED KINGDOM

ENGLAND

Hewlett-Packard Ltd.
Customer Information Centre
King St. Lane
Winnersh, Wokingham
GB-**BERKSHIRE** RG11 5AR
Tel: (44/734) 784774
Telex: 847178
Fax: 777285

Hewlett-Packard Ltd.
Miller House
The Ring, **BRACKNELL**
Berkshire RG12 1XN
Tel: (44/344) 424-898
Fax: (44/344) 860015, Ext 56023

Hewlett-Packard Ltd.
Customer Sales & Support
Building 1, Filton Road
Stoke Gifford
BRISTOL, BS12 6QZ
Tel: (44/272) 236000

Hewlett-Packard Ltd.
Oakfield House, Oakfield Grove
Clifton **BRISTOL,** Avon BS8 2BN
Tel: 44-272-736 806
Telex: 444302

Hewlett-Packard Ltd.
9 Bridewell Place
LONDON EC4V 6BS
Tel: (44/583) 6565
Fax: (44/583) 6565, Ext 4713

Hewlett-Packard Ltd.
Heathside Park Rd.
Cheadle Heath, Stockport
GB-**MANCHESTER** SK3 ORB
Tel: (44/61) 428-0828
Telex: 668068
Fax: 4955009

Hewlett-Packard Ltd.
Harman House
No. 1 George St.
Uxbridge,
GB-**MIDDLESEX** UB8 1YH
Tel: (44/895) 72020
Telex: 893135
Fax: 73684

Hewlett-Packard Ltd.
Pontefract Road
NORMANTON,
West Yorkshire WF6 1RN
Tel: (44/924) 895-566
Fax: (44/924) 896-691
Telex: 557355

Hewlett-Packard Ltd.
The Quadrangle
106-118 Station Road
REDHILL, Surrey RH1 1PS
Tel: 44-737-686-55
Telex: 947234

Hewlett-Packard Ltd.
Avon House
435 Stratford Road
Shirley, **SOLIHULL,** West Midlands
B90 4BL
Tel: 44-21-745-8800
Telex: 339105

Hewlett-Packard Ltd.
Heathside Park Road
Cheadle Heath, Stockport
Cheshire SK3 ORB
Tel: (44/61) 428-0828
Fax: (44/61) 495-5009
Telex. 668068

Hewlett-Packard Ltd.
Harman House
No. 1 George Street
UXBRIDGE, Middlesex UB8 1YH
Tel: (44/895) 72020
Fax: (44/895) 73684

Hewlett-Packard Ltd.
King Street Lane
Winnersh, **WOKINGHAM**
Berkshire RG11 5AR
Tel: (44/734) 784774
Fax: (44/734) 777285 Ext 52285

NORTHERN IRELAND

Hewlett-Packard (Ireland) Ltd.
Carrickfergus Industrial Centre
75 Belfast Road, Carrickfergus
CO. ANTRIM BT38 8PM
Tel: 09603 67333

Unit 5
Bridgewood House
Newforge Lane
Malone Road
BELFAST BT95 NW
Tel: (353/232) 664-851
Fax: (353/232) 665-619

SCOTLAND

Hewlett-Packard Ltd.
1/3 Springburn Place
College Milton North
EAST KILBRIDE, G74 5NU
Tel: 035-52-49261
Fax: 03552-35929
Telex 779615

Hewlett-Packard Ltd.
SOUTH QUEENSFERRY
West Lothian, EH30 9TG
Tel: 031-331-1188
Fax: 031-331-7412

UNITED STATES

Hewlett-Packard Co.
Customer Information Center
Tel: (800) 752-0900
Hours: 6:00 AM to 5:00 PM
Pacific Time

Alabama

Hewlett-Packard Co.
2100 Riverchase Center
Building 100 - Suite 118
BIRMINGHAM, AL 35244
Tel: (205) 988-0547
Fax: (205) 988-5308

Hewlett-Packard Co.
620 Discovery Dr.
HUNTSVILLE, AL 35806
Tel: (205) 830-2000
Fax: (205) 830-1427

Alaska

Hewlett-Packard Co.
4000 Old Seward Highway
Suite 101
ANCHORAGE, AK 99503
Tel: (907) 563-8855
Fax: (907) 561-7409

Arizona

Hewlett-Packard Co.
8080 Pointe Parkway West
PHOENIX, AZ 85044
Tel: (602) 273-8000
Fax: (602) 273-8080

Hewlett-Packard Co.
3400 East Britannia Dr.
Bldg. C, Suite 124
TUCSON, AZ 85706
Tel: (602) 573-7400
Fax: (602) 573-7429

Arkansas

Hewlett-Packard Co.
10816 Executive Center Dr
Conway Bldg. Suite 116
LITTLE ROCK, AR 72211
Tel: (501) 225-7178
Fax: (501) 221-3614

California

Hewlett-Packard Co.
26701 W. Argoura Rd.
CALABASAS, CA 91302
Tel: (818) 880-3400
Fax: (818) 880-3437

Hewlett-Packard Co.
353 Lakeside Dr
FOSTER CITY, CA 94404
Tel: (415) 378-8400
Fax: (415) 378-8405

Hewlett-Packard Co.
1907 North Gateway Blvd.
FRESNO, CA 93727
Tel: (209) 252-9652
Fax: (209) 456-9302

Hewlett-Packard Co.
1421 S. Manhattan Av.
FULLERTON, CA 92631
Tel: (714) 999-6700
Fax: (714) 778-3033

Hewlett-Packard Co.
7408 Hollister Ave. #A
GOLETA, CA 93117
Tel: (805) 685-6100
Fax: (805) 685-6163

Hewlett-Packard Co.
9800 Muirlando Ave.
IRVINE, CA 92718
Tel: (714) 472-3000
Fax: (714) 581-3607 (Direct Dial only)

Hewlett-Packard Co.
2525 Grand Avenue
LONG BEACH, CA 90815
Tel: (213) 498-1111
Fax: (213) 494-1986

Hewlett-Packard Co.
5651 West Manchester Ave.
LOS ANGELES, CA 90045
Tel: (213) 337-8000
Fax: (213) 337-8338

Hewlett-Packard Co.
321 E. Evelyn Ave.
Bldg. 330
MOUNTAIN VIEW, CA 94039
Tel: (415) 694-2000
Fax: (415) 694-0600

Hewlett-Packard Co.
5161 Lankershim Blvd.
NORTH HOLLYWOOD, CA 91601
Tel: (818) 505-5600
Fax: (818) 505-5875

Hewlett-Packard Co.
5725 W. Las Positas Blvd.
PLEASANTON, CA 94566
Tel: (415) 460-0282
Fax: (415) 460-0713

Hewlett-Packard Co.
4244 So. Market Court, Suite A
SACRAMENTO, CA 95834
Tel: (916) 929-7222
Fax: (916) 927-7152

Hewlett-Packard Co.
9606 Aero Drive
SAN DIEGO, CA 92123
Tel: (619) 279-3200
Fax: (619) 268-8487

Hewlett-Packard Co.
50 Fremont St. Suite 200
SAN FRANCISCO, CA 94105
Tel: (415) 882-6800
Fax: (415) 882-6805

Hewlett-Packard Co.
3003 Scott Boulevard
SANTA CLARA, CA 95054
Tel: (408) 988-7000
Fax: (408) 988-7103

Hewlett-Packard Co.
5280 Valentine Rd. Suite 205
VENTURA, CA 93003
Tel: (805) 658-6898
Fax: (805) 650-0721

Colorado

Hewlett-Packard Co.
2945 Center Green Court South
Suite A
BOULDER, CO 80301
Tel: (303) 938-3065
Fax: (303) 938-3025

Hewlett-Packard Co.
24 Inverness Place, East
ENGLEWOOD, CO 80112
Tel: (303) 649-5000
Fax: (303) 649-5787

Connecticut

Hewlett-Packard Co.
3 Parkland Dr.
DARIEN, CT 06820
Tel: (203) 656-0040
Fax: (203) 656-5563

Hewlett-Packard Co.
115 Glastonbury Blvd
GLASTONBURY, CT 06033
Tel: (203) 633-8100
Fax: (203) 659-6087

Florida

Hewlett-Packard Co.
5900 N. Andrews, Suite 100
FORT LAUDERDALE, FL 33309
Tel: (305) 938-9800
Fax: (305) 938-2293

Hewlett-Packard Co.
6800 South Point Parkway
Suite 301
JACKSONVILLE, FL 32216
Tel: (904) 636-9955
Fax: (904) 636-9955

Hewlett-Packard Co.
255 East Drive, Suite B
MELBOURNE, FL 32901
Tel: (407) 729-0704
Fax: (407) 723-4557

Hewlett-Packard Co.
6177 Lake Ellenor Drive
ORLANDO, FL 32809
Tel: (407) 859-2900
Fax: (407) 826-9309

Hewlett-Packard Co.
4700 Bayou Blvd.
Building 5
PENSACOLA, FL 32503
Tel: (904) 476-8422
Fax: (904) 476-4116

Hewlett-Packard Co.
5550 Idlewild, #150
TAMPA, FL 33634
Tel: (813) 884-3282
Fax: (813) 889-4445

Georgia

Hewlett-Packard Co.
2015 South Park Place
ATLANTA, GA 30339
Tel: (404) 955-1500
Fax: (404) 980-7669

Hewlett-Packard Co.
3607 Parkway Lane
Suite 300
NORCROSS, GA 30092
Tel: (404) 448-1894
Fax: (404) 246-5206

Hawaii

Hewlett-Packard Co.
Pacific Tower
1001 Bishop St.
Suite 2400
HONOLULU, HI 96813
Tel: (808) 526-1555
Fax: (808) 536-7873

Idaho

Hewlett-Packard Co.
11309 Chinden Blvd.
BOISE, ID 83714
Tel: (208) 323-2700
Fax: (208) 323-2528

Illinois

Hewlett-Packard Co.
2205 E. Empire St.
BLOOMINGTON, IL 61704
Tel: (309) 662-9411
Fax: (309) 662-0351

Hewlett-Packard Co.
525 W. Monroe St., Suite 1308
CHICAGO, IL 60606
Tel: (312) 930-0010
Fax: (312) 930-0986

Hewlett-Packard Co.
1200 East Diehl Road
NAPERVILLE, IL 60566
Tel: (312) 357-8800
Fax: (312) 357-9896

Hewlett-Packard Co.
5201 Tollview Drive
ROLLING MEADOWS, IL 60008
Tel: (312) 255-9800
Fax: (312) 259-5878

Indiana

Hewlett-Packard Co.
11911 N. Meridian St.
CARMEL, IN 46032
Tel: (317) 844-4100
Fax: (317) 843-1291

Hewlett-Packard Co.
111 E. Ludwig Road
Suite 108
FT. WAYNE, IN 46825
Tel: (219) 482-4283
Fax: (219) 482-9907

Iowa

Hewlett-Packard Co.
4050 River Center Court
CEDAR RAPIDS, IA 52402
Tel: (319) 393-0606
Fax: (319) 378-1024

Hewlett-Packard Co.
4201 Corporate Dr.
WEST DES MOINES, IA 50265
Tel: (515) 224-1435
Fax: (515) 224-1870

Kansas

Hewlett-Packard Co.
North Rock Business Park
3450 N. Rock Rd.
Suite 300
WICHITA, KS 67226
Tel: (316) 636-4040
Fax: (316) 636-4504

Kentucky

Hewlett-Packard Co.
305 N. Hurstbourne Lane,
Suite 100
LOUISVILLE, KY 40222
Tel: (502) 426-0100
Fax: (502) 426-0322

Louisiana

Hewlett-Packard Co.
160 James Drive East
ST. ROSE, LA 70087
Tel: (504) 467-4100
Fax: (504) 467-4100 x 291

Maryland

Hewlett-Packard Co.
3701 Koppers Street
BALTIMORE, MD 21227
Tel: (301) 644-5800
Fax: (301) 362-7650

Hewlett-Packard Co.
2 Choke Cherry Road
ROCKVILLE, MD 20850
Tel: (301) 948-6370
Fax: (301) 948-5986

Massachusetts

Hewlett-Packard Co.
1775 Minuteman Road
ANDOVER, MA 01810
Tel: (508) 682-1500
Fax: (508) 794-2619

Hewlett-Packard Co.
29 Burlington Mall Rd.
BURLINGTON, MA 01803-4514
Tel: (617) 270-7000
Fax: (617) 221-5240

Michigan

Hewlett-Packard Co.
3033 Orchard Vista S.E.
GRAND RAPIDS, MI 49546
Tel: (616) 957-1970
Fax: (616) 956-9022

Hewlett-Packard Co.
39550 Orchard Hill Place Drive
NOVI, MI 48050
Tel: (313) 349-9200
Fax: (313) 349-9240

Hewlett-Packard Co.
560 Kirts Rd.
Suite 101
TROY, MI 48084
Tel: (313) 362-5180
Fax: (313) 362-3028

Minnesota

Hewlett-Packard Co.
2025 W. Larpenteur Ave.
ST. PAUL, MN 55113
Tel: (612) 644-1100
Fax: (612) 641-9787

Mississippi

Hewlett-Packard Co.
800 Woodland Parkway, Suite 101
RIDGELAND, MS 39157
Tel: (601) 957-0730
Fax: (601) 957-2515

Missouri

Hewlett-Packard Co.
13001 Hollenberg Drive
BRIDGETON 63044
Tel: (314) 344-5100
Fax: (314) 344-5273

Hewlett-Packard Co.
6601 Winchester Ave.
KANSAS CITY, MO 64133
Tel: (816) 737-0071
Fax: (816) 737-4690

Montana

Hewlett-Packard Co.
13001 Hollenberg Drive
BRIDGETON, MT 63044
Tel: (314) 344-5100
Fax: (314) 344-5273

Nebraska

Hewlett-Packard
11626 Nicholas St.
OMAHA, NE 68154
Tel: (402) 493-0300
Fax: (402) 493-4334

New Jersey

Hewlett-Packard Co.
120 W. Century Road
PARAMUS, NJ 07653
Tel: (201) 599-5000
Fax: (201) 599-5382

Hewlett-Packard Co.
10 Sylvan Way
PARSIPPANY, NJ 07054
Tel: (201) 682-4000
Fax: (201) 682-4031

Hewlett-Packard Co.
20 New England Av.
PISCATAWAY, NJ 08854
Tel: (201) 562-6100
Fax: (201) 562-6246

New Mexico

Hewlett-Packard Co.
7801 Jefferson N.E.
ALBUQUERQUE, NM 87109
Tel: (505) 823-6100
Fax: (505) 823-1243

Hewlett-Packard Co.
1362-C Trinity Dr.
LOS ALAMOS, NM 87544
Tel: (505) 662-6700
Fax: (505) 662-4312

New York

Hewlett-Packard Co.
5 Computer Drive South
ALBANY, NY 12205
Tel: (518) 458-1550
Fax: (518) 458-1550 x 0393

Hewlett-Packard Co.
130 John Muir Dr.
AMHERST, NY 14228
Tel: (716) 689-3003
Fax: (716) 636-7034

Hewlett-Packard Co.
200 Cross Keys Office Park
FAIRPORT, NY 14450
Tel: (716) 223-9950
Fax: (716) 223-6331

Hewlett-Packard Co.
7641 Henry Clay Blvd.
LIVERPOOL, NY 13088
Tel: (315) 451-1820
Fax: (315) 451-1820 x 255

Hewlett-Packard Co.
No. 1 Pennsylvania Plaza
55th Floor
34th Street & 7th Avenue
MANHATTAN NY 10119
Tel: (212) 971-0800
Fax: (212) 330-6967

Hewlett-Packard Co.
2975 Westchester Ave
PURCHASE, NY 10577
Tel: (914) 935-6300
Fax: (914) 935-6497

Hewlett-Packard Co.
Executive Square Office Bldg.
66 Middlebush Rd.
WAPPINGERS FALLS, NY 12590
Tel: (914) 298-9125
Fax: (914) 298-9154

Hewlett-Packard Co.
3 Crossways Park West
WOODBURY, NY 11797
Tel: (516) 682-7800
Fax: (516) 682-7806 (2)

North Carolina

Hewlett-Packard Co.
305 Gregson Dr.
CARY, NC 27511
Tel: (919) 467-6600
Fax: (919) 460-2296
(919) 460-2297

Hewlett-Packard Co.
P.O. Box 240318
CHARLOTTE, NC 28224
Tel: (704) 527-8780
Fax: (704) 523-7857

Hewlett-Packard Co.
7029 Albert Pick Rd. #100
GREENSBORO, NC 27409
Tel: (919) 665-1800
Fax: (919) 668-1797
Mailing Address
PO Box 26500
Greensboro, NC 27426

Ohio

Hewlett-Packard Co.
2717 S. Arlington Rd.
AKRON 44312
Tel: (216) 644-2270
Fax: (216) 644-7415

Hewlett-Packard Co.
4501 Erskine Road
CINCINNATI, OH 45242
Tel: (513) 891-9870
Fax: (513) 891-0033

UNITED STATES (Cont'd)

Hewlett-Packard Co.
Moutroffe West Ave.
COPLEY, OH 44321
Tel: (216) 666-7711
Fax: (216) 666-6054

Hewlett-Packard Co.
7887 Washington Village Dr.
DAYTON, OH 45459
Tel: (513) 433-2223
Fax: (513) 433-8633

Hewlett-Packard Co.
9080 Springboro Pike
MIAMISBURG 45342
Tel: (513) 433-2223
Fax: (513) 433-3633

Hewlett-Packard Co.
15885 Sprague Road
STRONGSVILLE, OH 44136
Tel: (216) 243-7300
Fax: (216) 234-7230

Hewlett-Packard Co.
One Maritime Plaza, 5th Floor
720 Water Street
TOLEDO, OH 43604
Tel: (419) 242-2200
Fax: (419) 241-7655

Hewlett-Packard Co.
675 Brooksedge Blvd.
WESTERVILLE, OH 43081
Tel: (614) 891-3344
Fax: (614) 891-1476

Oklahoma

Hewlett-Packard Co.
3525 N.W. 56th St.
Suite C-100
OKLAHOMA CITY, OK 73112
Tel: (405) 946-9499
Fax: (405) 942-2127

Hewlett-Packard Co.
6655 South Lewis,
Suite 105
TULSA, OK 74136
Tel: (918) 481-6700
Fax: (918) 481-2250

Oregon

Hewlett-Packard Co.
9255 S. W. Pioneer Court
WILSONVILLE, OR 97070
Tel: (503) 682-8000
Fax: (503) 682-8155

Pennsylvania

Hewlett-Packard Co.
Heatherwood Industrial Park
50 Dorchester Rd.
P.O. Box 6080
HARRISBURG, PA 17112
Tel: (717) 657-5900
Fax: (717) 657-5946

Hewlett-Packard Co.
111 Zeta Drive
PITTSBURGH, PA 15238
Tel: (412) 782-0400
Fax: (412) 963-1300

Hewlett-Packard Co.
2750 Monroe Boulevard
VALLEY FORGE, PA 19482
Tel: (215) 666-9000
Fax: (215) 666-2034

South Carolina

Hewlett-Packard Co.
Brookside Park, Suite 122
1 Harbison Way
COLUMBIA, SC 29212
Tel: (803) 732-0400
Fax: (803) 732-4567

Hewlett-Packard Co.
545 N. Pleasantburg Dr.
Suite 100
GREENVILLE, SC 29607
Tel: (803) 232-8002
Fax: (803) 232-8739

Tennessee

Hewlett-Packard Co.
One Energy Center Suite 200
Pellissippi Pkwy.
KNOXVILLE, TN 37932
Tel: (615) 966-4747
Fax: (615) 966-8147

Hewlett-Packard Co.
889 Ridge Lake Blvd.,
Suite 100
MEMPHIS, TN 38119
Tel: (901) 763-4747
Fax: (901) 762-9723

Hewlett-Packard Co.
44 Vantage Way,
Suite 160
NASHVILLE, TN 37228
Tel: (615) 255-1271
Fax: (615) 726-2310

Texas

Hewlett-Packard Co.
9050 Capital of Texas Highway, North
#290
AUSTIN, TX 78759
Tel: (512) 346-3855
Fax: (512) 338-7201
Mailing Address
PO Box 9431
Austin, TX 78766-9430

Hewlett-Packard Co.
5700 Cromo Dr
EL PASO, TX 79912
Tel: (915) 833-4400
Fax: (915) 581-8097

Hewlett-Packard Co.
10535 Harwin Drive
HOUSTON, TX 77036
Tel: (713) 776-6400
Fax: (713) 776-6495

Hewlett-Packard Co.
3301 West Royal Lane
IRVING, TX 75063
Tel: (214) 869-3377
Fax: (214) 830-8951

Hewlett-Packard Co.
109 E. Toronto, Suite 100
McALLEN, TX 78503
Tel: (512) 630-3030
Fax: (512) 630-1355

Hewlett-Packard Co.
930 E. Campbell Rd.
RICHARDSON, TX 75081
Tel: (214) 231-6101
Fax: (214) 699-4337

Hewlett-Packard Co.
14100 San Pedro Ave., Suite 100
SAN ANTONIO, TX 78232
Tel: (512) 494-9336
Fax: (512) 491-1299

Utah

Hewlett-Packard Co.
3530 W. 2100 South
SALT LAKE CITY, UT 84119
Tel: (801) 974-1700
Fax: (801) 974-1780

Virginia

Hewlett-Packard Co.
840 Greenbrier Circle
Suite 101
CHESAPEAKE, VA 23320
Tel: (804) 424-7105
Fax: (804) 424-1494

Hewlett-Packard Co.
4401 Water Front Dr.
GLEN ALLEN, VA 23060
Tel: (804) 747-7750
Fax: (804) 965-9297

Hewlett-Packard Co.
2800 Electric Road Suite 100
ROANOKE, VA 24018
Tel: (703) 774-3444
Fax: (703) 989-8049

Washington

Hewlett-Packard Co.
15815 S.E. 37th Street
BELLEVUE, WA 98006
Tel: (206) 643-4000
Fax: (206) 643-8748

Hewlett-Packard Co.
N. 1225 Argonne Rd
SPOKANE, WA 99212-2657
Tel: (509) 922-7000
Fax: (509) 927-4236

West Virginia

Hewlett-Packard Co.
501 56th Street
CHARLESTON, WV 25304
Tel: (304) 925-0492
Fax: (304) 925-1910

Wisconsin

Hewlett-Packard Co.
275 N. Corporate Dr.
BROOKFIELD, WI 53005
Tel: (414) 792-8800
Fax: (414) 792-0218

URUGUAY

Pablo Ferrando S.A.C. e I.
Avenida Italia 2877
Casilla de Correo 370
MONTEVIDEO
Tel: 59-82-802-586
Telex: 398802586

Olympia de Uruguay S.A.
Maquines de Oficina
Avda. del Libertador 1997
Casilla de Correos 6644
MONTEVIDEO
Tel: 91-1809, 98-3807
Telex: 6342 OROU UY

VENEZUELA

Analytical Supplies, CA
Quinta #103 Impermes
Av El Centro
Los Chorros
Apartado 75472
CARACAS
Tel: 364904, 2394047
Telex: 26274 CABIC

Hewlett-Packard de Venezuela C.A.
Residencias Tia Betty Local 1
Avenida 3 Y con Calle 75
MARACAIBO, Estado Zulia
Apartado 2646
Tel: 586175669
Telex: 62464 HPMAR

YUGOSLAVIA

Do Hermes
General Zdanova 4
YU-11000 **BEOGRAD**
Tel: (011) 342 641
Telex: 11433

Do Hermes
Celovska 73
YU-61000 **LJUBLJANA**
Tel: (061) 553 170
Telex: 31583

ZAIRE

C.I.E.
Computer & Industrial Engineering
25 Ave. de la Justice Gombe
Boite Postale 10976
KINSHASA
Tel: 32 063, 32 633, 28 251
Telex: 21552
Fax: 22 850

ZAMBIA

R.J. Tilbury (Zambia) Ltd.
P.O. Box 32792
LUSAKA
Tel: 21 55 80
Telex: 40128

ZIMBABWE

Field Consolidated (Private) Ltd.
Systron Division
Manhattan Court
61 Second Street
P.O. Box 3458
HARARE
Tel: 73 98 81
Telex: 26241
Fax: 70 20 08

Please send directory corrections to:
Test & Measurement Catalog
Hewlett-Packard Company
3200 Hillview Avenue
Palo Alto, CA 94304
Tel: (415) 857-4706
Fax: (415) 857-3880

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